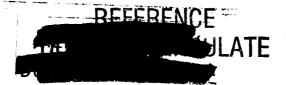
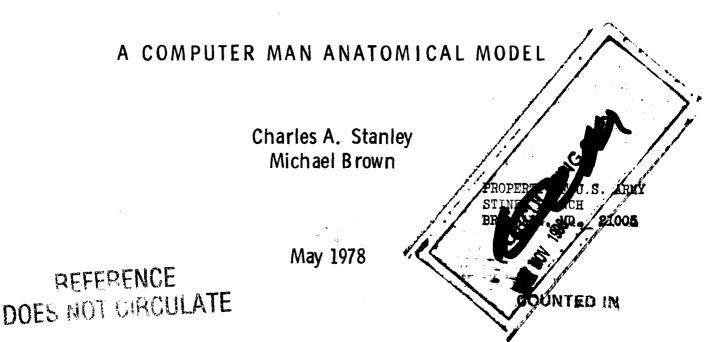


## ARBRL-TR-02060 ADA056564



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### TECHNICAL REPORT ARBRL-TR-02060





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This report gives a detailed comprehensive description of the Computer Man model. Complete documentation of all the required programs is provided.

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### TABLE OF CONTENTS

		Page
	LIST OF ILLUSTRATIONS	5
I.	INTRODUCTION	7
II.	VULNERABILITY	7
III.	COMPUTER MAN TARGET DESCRIPTION	9
	A. Origin of Computer Man	9
	B. Description Used for Incapacitation Studies	9
	C. Description Used for Lethality Studies	9
	D. Assembly of Cross Sections	9
	E. Positioning the Computer Man in Three-Dimensional Space.	13
	F. Computer Man Body Box	13
	G. Cross-Sectional Oddities	17
IV.	COMPUTER MAN FILES	19
	A. Card Description	19
	B. Tape Description	20
	C. Disc Description	26
V.	COMPUTER MAN PROGRAMS - LETHALITY	28
	A. Disc Load and Average Score Programs	28
	B. Change Value Program	33
	C. Tape Translation Program	35
	D. Computer Man Delineation Program	39
	E. Instructions for Using Lethality Programs	41
VI.	COMPUTER MAN PROGRAMS - INCAPACITATION	42
	A. Model Repositioning	

### TABLE OF CONTENTS (Continued)

			Page
VI.	COMPUTER MAN I	PROGRAMS - INCAPACITATION (continued)	42
	B. Foot Slice	e Addition	44
	C. Mosaic Pr	intout	46
	APPENDIX A. A	Assignment of Tissue Codes	49
	APPENDIX B. S	Slice Descriptions - Incapacitation	59
	APPENDIX C. S	Slice Descriptions - Lethality	145
	APPENDIX D. 1	Flowcharts and Programs	231
	DISTRIBUTION I	LIST	263

### LIST OF FIGURES

Figure	е	Page
1.	A Front View of the Computer Man Indicating the Approximate Intervals at Which Slices Were Taken in the Thorax and Abdomen	10
2.	A Cross Section Taken from "A Cross-Section Anatomy" overlayed with Grid Mesh	1 11
3.	A Pictorial View of a Chosen Cross Section Illustrating the Positioning and Contents of the Rectangular Blocks	12
4.	A Visual Representation (Front View) of a Computer Man Description	14
5.	A Visual Representation (Side View) of a Computer Man Description	15
6.	The Positioning of the Computer Man in a Right-Hand Coordinat System	e 16
7.	An Illustration Depicting the Ordering Procedure Employed in Generating Card Files	21
8.	Card Format of Cross Sections Representing the Initial Three Cuts Taken in the Head	22
9.	An Illustration of the Positioning of the Card Data Inside th Target Matrix Using the Specified Parameters	e 23
10.	Card File Configuration	24
11.	A Representation of the Disc Structure of the Computer Man (Lethality)	29
12.	A Representation of the Disc Structure of the Computer Man (Incapacitation)	45



### I. INTRODUCTION

The following is a report on the design and development of the Computer Man for application to vulnerability studies of military personnel engaged in combat environments and subjected to various weapon threats. Although this model is not currently in use at the Ballistic Research Laboratory (BRL), it is presented in order to document the work done, and because the model may be of interest in future personnel vulnerability studies.

For many years injury criteria were based upon medical assessments of autopsy reports derived from animal experiments. However, attempts to correlate the effects of physiological damage in humans with that produced in animals led to certain difficulties. To avoid these problems, it was decided in 1974 to shift the personnel vulnerability effort to that of modeling the wounding process. Hence, the development of the Computer Man came into existence. The Computer Man Anatomical Model is part of an overall effort that has been conducted in the Personnel Vulnerability Group to develop an analytical model which could be used to predict the effects wounds have on human functions for various classes of projectiles.

The computer generated three-dimensional representation of a human male is defined as the Computer Man. The Computer Man is essentially an organized array of tissue codes which are encountered when theoretically generated random trajectories strike and penetrate or perforate the body.

The essence of this report consists of instructions and programs written to construct, store and print Computer Man models. Detailed documentation is provided for their interpretation and use.

### II. VULNERABILITY

In the vulnerability analyses, the development of the criteria relating to the effects wounds have on a soldier's ability to perform in a combat environment, and the scope of the methodology used, is quite extensive. Moreover, since incapacitation and lethality are the basic injury classifications studied in formulating the codes which make up the Computer Man, these two areas of interest will be discussed briefly here.

For the incapacitation data used with the Computer Man Anatomical Model described in this report, surgeons were asked to evaluate a list

<sup>1.</sup> W. Kokinakis and J. Sperrazza, "Criteria for Incapacitating Soldiers with Fragments and Flechettes," Ballistic Research Laboratories Report No. 1269, Jan 1965.

of 181 tissues which, when rendered non-functional by a penetrating projectile, could induce some level of incapacitation with respect to a given scenario. A detailed description of the tissue codes which define the Computer Man is listed for reference in Appendix A. Three time frames were stipulated in conjunction with each of two classifications of combat roles:

- assault immediate.
   defense immediate.
- 2. assault ≤ 30 sec.
  defense ≤ 30 sec.
- 3. assault ≤ 5 min.
  defense ≤ 5 min.

Surgeons used a range of whole numbers (0-100) to indicate quantitatively the level of incapacitation rendered. Pain was of no consideration. Approximately a third of the anatomical tissues were assigned non-zero scores.

To generate the tools for the lethality analysis a different approach was undertaken. A team of surgeons was presented a set of gridded anatomical cross sections as developed by Eycleshymer and Schoemaker. The medical assessors were asked to independently estimate the effects of the removal of a defined quantity of body tissue on human survivability. A relative scale of whole numbers (1-10) was employed. A score was entered for each tissue cell defined on a cross section based upon the probability of death occurring, given the removal of a single cell. Scenarios were established for four time frames relative to the availability of expert medical aid; within 30 minutes, within one hour, within six hours, and no treatment.

The number of assessments differ for each of the preceding time frames. Initially, three assessors were asked to make estimates on all cells throughout the body. Subsequently, an additional group of assessors were asked to provide estimates for those parts of the body for which they were considered specialists. In these cases the body was divided into four sections; head and neck, thorax, abdomen and pelvis, and limbs. Composite evaluations are treated in the same manner as individual evaluations. Specific details on the medical judgment process for estimating incapacitation, as well as lethality, and the methodology used to correlate damage with incapacitation/lethality, will be documented in a BRL publication which is presently being organized. In the interim, queries concerning the medical inputs to the Computer Man Anatomical Model should be addressed to Director. Ballistic Research Laboratory, ATTN: DRDAR-BLV, Aberdeen Proving Ground, MD 21005.

<sup>2.</sup> A.C. Eycleshymer and D.M. Schoemaker, "A Cross-Section Anatomy," 215pp, D. Appleton - Century Company, New York and London, 1911.

### III. COMPUTER MAN TARGET DESCRIPTION

### A. Origin of Computer Man

Physical dimensions of the Computer Man are based upon photographs taken from the Cross-Section Anatomy of reference 2, in which a set of 108 horizontal cross sections pertaining to an adult male are given. The anatomical cross sections are grouped according to body parts; head and neck (cross sections 1-18); thorax, abdomen and pelvis (cross sections 19-44); left arm (cross sections 50-75); left leg and foot (cross sections 76-113). Cross sections (45-49) are descriptions of the female organs taken in the pelvic region and are not included in our study. Figure 1 illustrates the approximate intervals at which slices were taken from the human anatomy in the thorax, abdomen and pelvis. The spacing between slices is 2.6 cm.

The initial step in the Computer Man development is conducted by superimposing a grid mesh onto each photograph and examining the contents of each cell present. A representative cross section is illustrated in Figure 2. A set of tissue codes was devised based upon the principle tissue contained in each cell and each cross section was stored in computer memory as a two-dimensional array. A pictorial view of a typical cross section is displayed in Figure 3. The integers present in the cells for this illustration indicate lethality scores.

### B. Description Used for Incapacitation Studies

For incapacitation the dimensions of each grid cell are .5cm  $\times$  .5cm  $\times$  1.2cm in the head and neck; throughout the remainder of the body the dimensions are .5cm  $\times$  .5cm  $\times$  2.6cm. The contents of each cell is a tissue code which is an integer in the range (2-200). The incapacitation estimates assigned by medical assessors are not part of the target description but can be cross referenced with their associated tissue codes whenever a computation is required.

### C. Description Used for Lethality Studies

For lethality the dimensions of each cell are  $lcm \times lcm \times 1.2cm$  in the head and neck; throughout the rest of the body the dimensions are  $lcm \times 1cm \times 2.6cm$ . The contents of each cell is an assessor's evaluation, an integer in the range (1-10).

### D. Assembly of Cross Sections

All arrays are grouped into a superset consisting of 108 elements (slices). Each array consists of a number of rows and columns. The row and column width is dependent on the area of each cross section and the mesh of each grid used. By stacking and attaching each slice in its properly related position, the initial set of 108 anatomical cross sections given in reference 2 evolved into a three-dimensional model

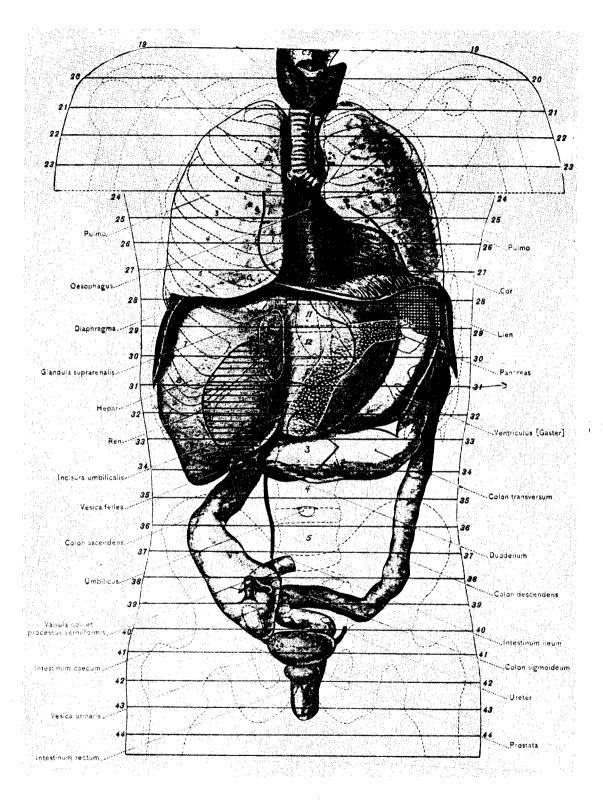


Figure 1. A Front View of the Computer Man Indicating the Approximate Intervals at which Slices Were Taken in the Thorax and Abdomen

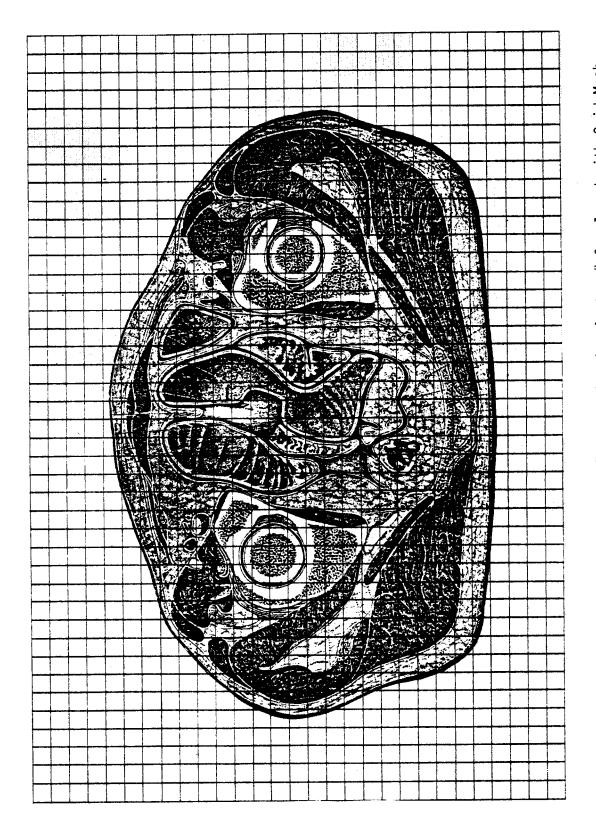
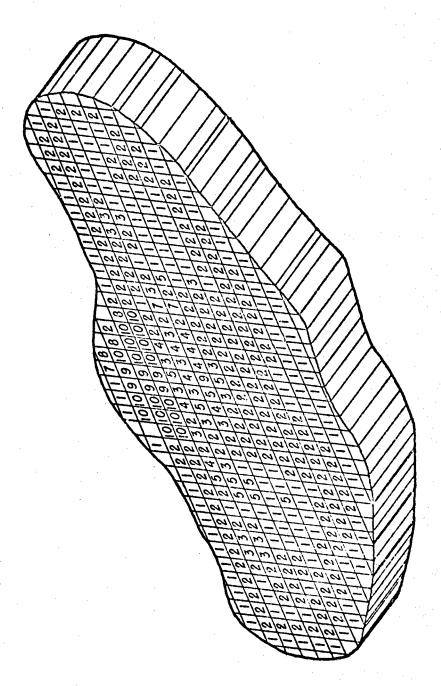


Figure 2. A Cross Section Taken From "A Cross-Section Anatomy" Overlayed with Grid Mesh



A Pictorial View of a Chosen Cross Section Illustrating the Positioning and Contents of the Rectangular Blocks Figure 3.

consisting of 82 composite cross sections. Figures 4 and 5 provide a visual characterization of the form the Computer Man assumes when stored in computer memory as a three-dimensional array. The right limbs were generated by merely reflecting the left limbs about the center line of the body.

In stacking the slices, a line of orientation was necessary to ensure that each cross section was aligned vertically with adjacent cross sections. This was accomplished through benchmarks between slices. In the arms and legs, large bones served as benchmarks. In the head, smaller slices were arranged above and below others by treating each slice as an elipsoid and matching their relative centers. In the torso, the vertebrae was employed as a benchmark. A more accurate procedure for establishing and utilizing benchmarks was not possible since cross-sectional anatomy data were prepared from a number of cadavers and body parts each of which differed in height, weight, age, and cross-sectional area.

### E. Positioning the Computer Man in Three-Dimensional Space

The Computer Man can be pictured as standing in a right-hand coordinate system as portrayed in Figure 6-A. If the coordinate axes are rotated so that the Computer Man can be viewed in his prone position, as illustrated in Figure 6-B, the Computer Man model slice descriptions can be easily interpreted. If slices are cut parallel to the xy plane, starting at the origin, the first body cells encountered are cells comprising the feet. Thereby the Computer Man was assembled feet first progressing in the +z direction until the total configuration was complete.

Appendix B lists a slice by slice computer description of the incapacitation model derived by substituting a symbol for each tissue code. Appendix A lists the symbolic identification code, cross sections where tissues are located and physical structure associated with each tissue code defined in the model.

Appendix C contains a slice by slice computer description of the lethality model. The average of all doctors' evaluations for the one hour time frame is given.

### F. Computer Man Body Box

The target analysis, specifically the ray tracing routines, was simplified by enclosing the Computer Man inside a rectangular box. The box is called the body box and its dimensions are slightly larger than those of the Computer Man. The boundaries of the body box are defined by the size of the three-dimensional array, MAN(I,J,K). It is

<sup>&</sup>quot;Slice descriptions representing additional time frames can be procured through the Target Assessment Branch, Vulnerability/Lethality Division, BRL.

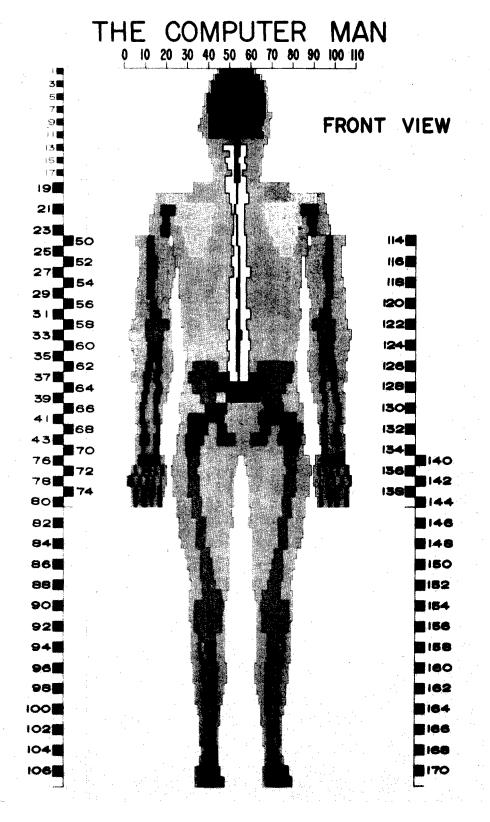


Figure 4. A Visual Representation of a Computer Man Description

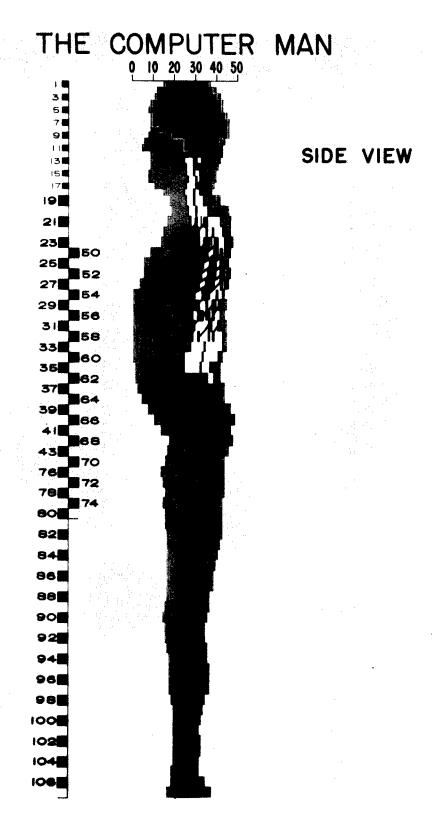


Figure 5. A Visual Representation of a Computer Man Description

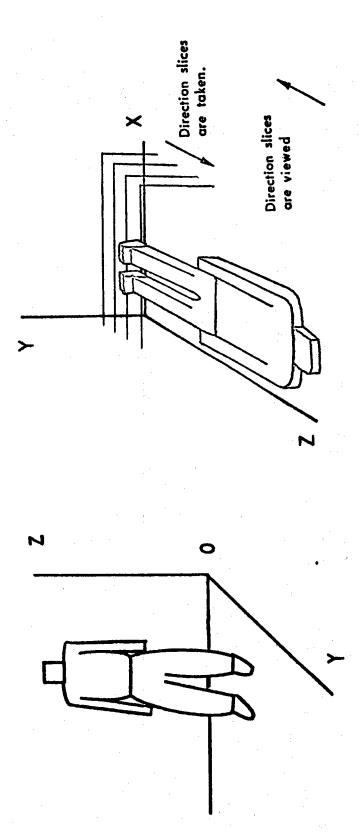


Figure 6-B.

Figure 6-A.

Figures 6-A, 6-B. The Positioning of the Computer Man in a Right-Hand Coordinate System

positioned entirely within the first quadrant with the origin serving as one of its vertices. The cellular structure for each Computer Man cross section extends to the edges of the box. As a result, many cells are incorporated into the Computer Man model which represent air space. These cells are identified with zeros. Each cell within the body box can be referenced in computer memory by a unique set of I,J,K coordinates. Since ray tracing is conducted in real space it is necessary to have a real characterization of the model. The specific dimensions of the body box and body cells are listed for both models in Table I.

### G. Cross-Sectional Oddities

- 1. Arms. In viewing arm slices of the Computer Man, some peculiarities are apparent in both the lethality and incapacitation models. It appears that the left and right arm slices are not equally spaced with respect to the torso. One arm will appear to be merged with the torso while the opposite arm will be separated from the torso by two or three units. The condition varies from slice to slice but is evident on most of the cross sections taken in this region. There are three explanations for this.
- a. The shoulder slices do not fit into the grid system in a symmetrical fashion. Therefore the arms are misaligned relative to one another from the initial point where they are attached to the shoulders.
- b. The arms are intentionally raised slightly upward and outward from the body to correct the condition where the hands would otherwise overlap the hips.
- c. The third reason lies in the cells comprising the torso. The torso cross sections are not all of the same column and row width, thus after stacking every body cell on or adjacent to the perimeter on one slice does not necessarily have a body cell adjoined on the slice above or below it.
- 2. Torso. The outline of cells which form the perimeter of the Computer Man on each slice viewed may not always look symmetrical; that is, some cells or a number of consecutive cells may appear to be missing. Actually they are not. The reason for this is that the entire grid square is allocated even if only a small portion of body tissue would overlap the edge of this square, and thus when translated into its numeric or mosaic configuration, produces a jagged perimeter. This condition is primarily evident in the torso section.

Finally, as stated earlier, erratic differences in physical dimensions from slice to slice are inherent due to the fact, that cross-sections taken from the human anatomy were not all taken from the same man, but in fact represent a number of different individuals. The result is a Computer Man misaligned in some areas.

Table I. Graphical Dimensions of the Computer Man

# DIMENSIONS OF BODY BOX

LETHALITY	(1, J, K) COORDINATES REAL (X, Y, Z)	(50, 35, 84) (50cm., 35cm., 190.4cr	Y CELLS	LETHALITY (X,Y,Z)	(lcm., lcm., 1.2cm.)	(1cm., 1cm., 2.6cm.)
INCAPACITATION	(1, J, K) COORDINATES REAL (X, Y, Z)	(110, 55, 84) (55 cm., 275 cm., 190.4 cm.)	DIMENSIONS OF BODY CELLS	INCAPACITATION (X,Y,Z)	HEAD SLICES (1-18) (.5cm, .5cm., 1.2cm.)	BODY SLICES(19-113) (.5cm., .5cm., 2.6cm.)

### IV. COMPUTER MAN FILES

### A. Card Description

The initial step in storing doctors' assessments was conducted by generating a card file. This was done by copying the doctors' assessments for each gridded cross section provided onto card coding sheets and in turn onto punched cards.

In the case of incapacitation, a card description of the Computer Man was not constructed because an accurate target description already existed. However, the scheme discussed here, defined for lethality, is applicable to both models.

A card file was generated by placing the arguments NUM and SIG on each card where:

- (1) NUM = slice number given in Eycleshymer and Schoemaker.
- (2) SIG = a code number denoting the type of card being read.
  - -1 denotes a set of positioning parameters.
    - 1 denotes the first 23 entries to a given row follow.
    - 2 denotes the second 23 entries to a given row follow.
    - 3 denotes the third 23 entries to a given row follow.
    - 4 denotes the fourth 23 entries to a given row follow.
    - 5 denotes the fifth 23 entries to a given row follow.

The initial card (first card) which precedes each slice description contains six additional arguments MNR, MXR, MNC, MXC, NCOL, NROW, which assist in positioning the scores in the matrix A(I,J) that stores each slice description where:

- (3) MNR = minimum row number in submatrix.
- (4) MXR = maximum row number in submatrix.
- (5) MNC = minimum column number in submatrix.
- (6) MXC = maximum column number in submatrix.
- (7) NCOL = number of columns in submatrix.
- (8) NROW = number of rows in submatrix.

Immediately following the slice arguments are the scores associated with the grid cells that are present on each row defined on the cross-section. The cards which contain doctor assessments are called score cards. For a fixed grid mesh the number of score cards necessary to describe each individual slice is dependent on two factors: (1) the row and column width, and (2) the I/O format chosen.

For any given slice, score cards are arranged in the file rowwise in accordance with the following procedure. The card associated with the posterior and left most portion of the Computer Man was stacked immediately behind the first card (refer to Fig. 7). All the cards necessary to describe the back row follow consecutively until the right most portion of his body is completed. For lethality, two cards are sufficient to describe the row with the largest number of entries. row and each subsequent row that follows were stacked in the same manner until the last card, the card pertaining to the front row and right most portion of his body, was placed. The score cards consist of only the codes which pertain to body tissue. The remaining cells which are scored as zeros are omitted. Each succeeding slice description was then stacked in numerical order behind its predecessor until all slices were filed. The card format of cross sections representing the initial three cuts taken in the head is illustrated in Fig. 8. The matrix in Fig. 9 illustrates the positioning of a representative slice (slice 2) inside the array A(I,J) using the positioning parameters specified on the first card.

In building the Computer Man, slice positioning was difficult because each row of a given slice varied in width. So to simplify matters, the character "B" was chosen to fill in cells in the grid mesh which did not contain anatomical tissue, but could be used to square off a submatrix, thus giving each row of a given slice an equal number of cells and each score card an equal number of score positions. This technique facilitated positioning the submatrix inside A(I,J).

Four card files were constructed, one for each time frame stipulated. Each card file was divided into N sections where N is the number of separate doctors' assessments provided for each time frame. The sections can be organized in various ways but for assignment to disc storage they must be grouped as illustrated in Fig. 10.

### B. <u>Tape Description</u>

Tabs were made of the card description and corrections were entered when errors were revealed. The inspection and correction process was continued until an accurate description was obtained. Finally, each card file was loaded onto magnetic tape for permanent storage.

By storing the target description on an auxiliary peripheral, such as a tape or disc, and reading selected portions into core, when needed, the usage of the Computer Man can be fully accommodated with reasonable efficiency.

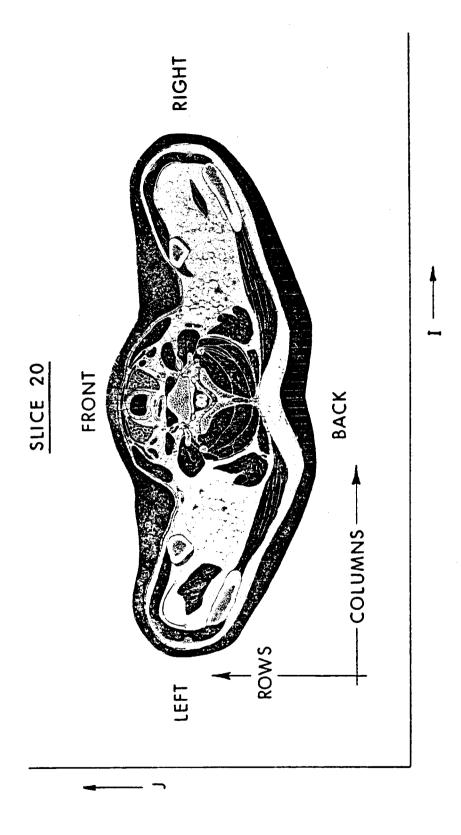


Figure 7. An Illustration Depicting the Ordering Procedure Employed in Generating Card Files

```
191122222354321611235577555432187B11255555555533218
                                                                                                                                                                                                                        13
12
33
45
44
33
21
B6
12
4
                                                                                     11222222245218
                                                               122222321
                                                                                                                                                           6
9
9
44554313113555555555431B3B1255555
                                                                                                                                                                                  6995331
                                    ·B
B
14
B
                                                                     29
B
1
2
3
3
6
6
7
4
                                                                                                                                                                                1 1 2 3 9 9 5 5 5 5 5 5 5 9 3 3 1 1
                                                                                                                                                          1235555555555321
                                                                                                                                                                                                        12495555555554
                                                                                                                                                                                                                                                                             113555555555321B
                                                                                                                                                                                                                                                                                                                           B11233332211
                                                                                                                                                                                                                                                                                                 244555055321
                                                                                                                                                                                                                         555555555543181248
                                                                                      3 2
                                        13
                                                                                                                                                         113555555555555421
                                                                                      R R 1 1 2 3 5 5 5 6
                                                                                                                                                                                  12355555555555531
                                                                                                                                                                                                         123995555555579
                                                                                                                                                                                                                                                       1245
                                                                                                                                                                                                                                                                             124555555555555421
                                                                                                                                                                                                                                                                                                                                                    B
                                                                                                                                                                                                                                                                                                    14555555555554
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                                                                                                                                                                                                                                                                                                                                                    812455656
                                                                                                                                                                                                                                                                                                                                                                          BP1123
                                                               B
B
                                                                1122222211
                                                                                      4321188
                                                                8
```

Figure 8. Card Format of Cross Sections Representing the Initial Three Cuts Taken in the Head

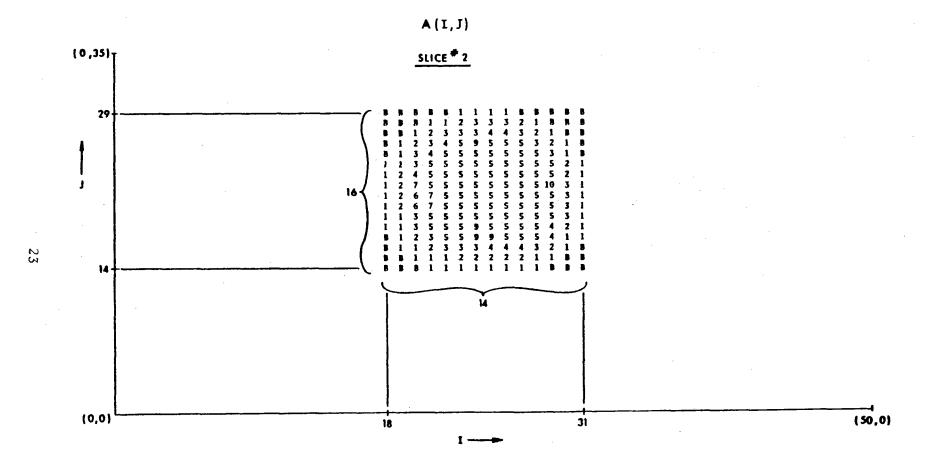


Figure 9. An Illustration of the Positioning of the Card Data Inside the Target Matrix Using the Specified Parameters

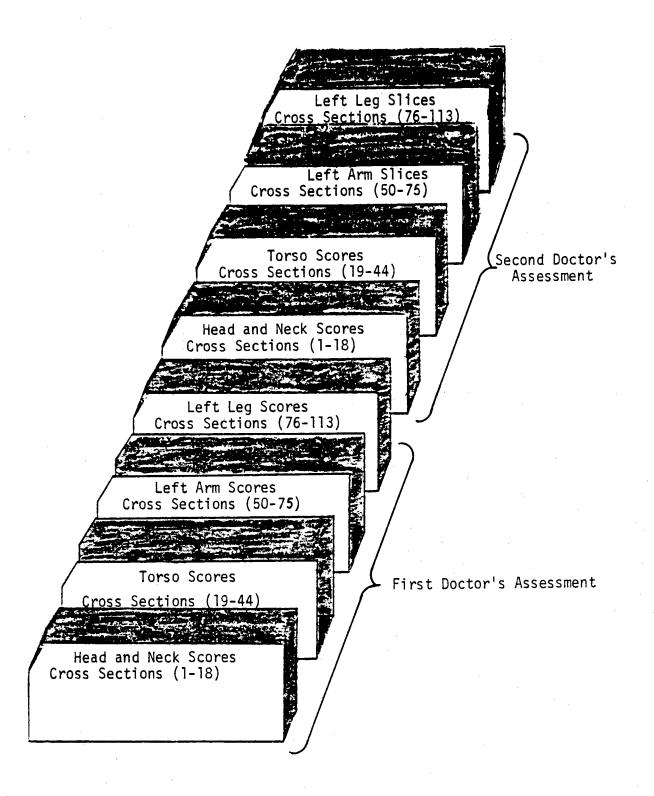


Figure 10. Card File Configuration

In early descriptions some doctors extended the range of scoring by using 0 as the lowest lethality score. This caused a problem because no distinction could be made between the minimum lethality score and code designated to represent air space. To resolve the problem each doctor's assessment was increased by 1, thus shifting the range of scoring from 0-10 to 1-11. Shortly afterwards the minimum lethality score was dropped. A tape translation program was written to facilitate these changes without having to punch new cards. In the revised edition the scores range in value (2-11).

The steps required for reading each cross section of the Computer Man into computer memory from tape are outlined below:

- (1) find SIG.
- (2) zero A(I,J).
- (3) read in positioning parameters defined on first card.
- (4) read in codes and position submatrix in A(I,J) designated by MNR. MXR. MNC. MXC.

Since slice descriptions were filed in the manner discussed in Section VI-A, this arrangement causes the Computer Man to be loaded into a right-hand coordinate system as illustrated in Fig. 6-A.

The following instructions reads each slice into A(I,J) rowwise; where A(I,J) is equivalent into PLANEl(I,J).

READ (4,00) NUM, MNR, MXR, MNC, MXC

100 FORMAT (13, 2X, 414)

DO 2000 J=MNR, MXR

READ(4,101) (PLANE1(I,J), I=MNC,MXC)

101 FORMAT (5X, 23I3)

2000 CONTINUE

By merely reversing the order in which row entries are stored in PLANE1(I,J) the Computer Man can be assembled in a left-hand coordinate system. If the latter is chosen the instructions required to do this would be as follows:

DO 2000 J=MNR,MXR

DO 2000 I=MNC, MXC

L = 50 - I

2000 READ(4,101)(PLANE1(L,J))

101 FORMAT (5X, 2313)

### C. <u>Disc Description</u>

The Ballistic Research Laboratory's Electronic Scientific Computers (BRLESC I, II) have the capability to store large quantities of data on a direct access disc. The advantage that disc storage offers is random access, in that selected portions of information can be accessed directly without reading over extraneous information which in turn results in less computer run time and improved program efficiency. Tapes are a form of sequential access and are fine for permanent storage but not for computational purposes. The user is assigned a private disc pack which in itself has a mass storage capability in excess of 800,000 words. The surfaces of the disc are divided into successive bands or tracks each of which consist of 398 words. For software purposes the disc can be divided into files for storage of separate programs or in our case, separate target descriptions, and each file can be subdivided into records. The length of each record cannot exceed 65,000 words and all records must be of equal length.

On account of the large size of the incapacitation model and the number of separate time frames required for the lethality model, more than one disc pack is required to file the descriptions.

Transferring the Computer Man description onto disc requires the definition of lethality arrays consisting of (50x35x82) entries for each of the four time frames stipulated. To work within the realm of 65,000 words of storage per disc record, the Computer Man was divided into three records with 28 slices/record. This generates 147,000 words of disc storage (50x35x84) and incorporates two additional (dummy) slices in the last record.

For incapacitation, (110x55x82) entries are required. To store a target description of this size requires in the order of a half million words. The number of slices per record must be lessened to accommodate a larger grid matrix, which in turn increases the number of records required. The choice of 14 records, allotting six slices/record, yields a total of 84 slices (82 real + 2 dummy).

To generate disc storage for the Computer Man the following specification statements must appear in the disc load routines:

**INCAPACITATION:** 

LETHALITY:

DATA DISC2/10H55D22 CMAN/

DATA IDD/10H50D21 BODY/

DATA FILE2/10HINCAP BODY/

DATA IDF/10HBODY

COMMON MAN2(110,55,6) NAME2(4)

COMMON MAN (50,35,28) NAME (4)

The following subroutine opens the disc and must appear before any other direct access disc subroutine is used.

CALL DISCOL (IDSC, IAVL, ICW, 'NEW DISC')

- (1) IDSC is the I/O system unit number.
- (2) IAVL is the address where the program disc label is stored.
- (3) ICW is the name given to the user's disc pack.
- (4) 'NEW DISC' is necessary for the initial run whenever a new disc pack is used; it must be removed from the argument list in succeeding runs.

INCAPACITATION: CALL DISCDL(3,NAME2,DISC2,'NEW DISC')

LETHALITY: CALL DISCOL (3, NAME, IDD, 'NEW DISC')

Before reading or writing can begin the disc files must first be defined.

CALL DISCOF(IFIL, LOR, NT, IAV, K)

- (1) IFIL the name given to the file.
- (2) LOF length of each record in the file.
- (3) NT number of disc tracks required.
- (4) IAV variable associated with IFIL (dummy argument).
- (5) K flag which will permit or prevent reading or writing from unwritten records.

INCAPACITATION: CALL DISCDF (FILE2, 36300, 1288, IDUMMY, 0)

LETHALITY: CALL DISCDF (IDF, 49000, 372, IDUMMY, 0)

In order to read or write on the disc the following subroutines are used:

CALL DISCRD (IFIL, IF, NR, A)

CALL DISCWT (IFIL, IR, NR, A)

- (1) IFIL the name given to the file.
- (2) IF the record number where reading or writing is to start.

- (3) NR the number of consecutive records to transmit.
- (4) A the memory address where reading or writing begins.

INCAPACITATION: CALL DISCDF (FILE2, RECORD, 1, MAN2)

CALL DISCWT (FILE2, RECORD, 1, MAN2)

record varies (1 - 14)

LETHALITY:

CALL DISCRD (IDF, RECORD, 1, MAN)

CALL DISCWT (IDF, RECORD, 1, MAN)

record varies (1 - 3)

In cases where information is transferred between two separate disc packs the system subroutine DISCSU is needed and must precede each disc read or write where a change in disc packs occurs.

CALL DISCSU (IDISC)

where IDISC is the system unit number for that particular disc.

### V. COMPUTER MAN PROGRAMS - LETHALITY

### A. Disc Load and Average Score Programs

1. <u>Discussion</u>. The Disc Load program loads the lethality description of the Computer Man onto the disc from tape and prints out the disc description of the Computer Man in its numeric representation for each doctor's evaluation given for a specified time frame.

Slice descriptions provided on cards and tape are arranged as shown in Fig. 10. With respect to time frames that require additional assessments, those assessments would follow in the order given. Fig. 11 illustrates the disc layout of the Computer Man after splicing and grafting of slices is performed. The disc load program is comprised of subroutines used to assemble, store and output the target description. A description of each subroutine used is given. The system subroutines utilized on BRLESC are not listed in this report but can be referenced in the BRLESC FORTRAN IV manual. Flow charts and programs complement the documentation and are included in Appendix D.

The Average Score program averages the individual doctors' evaluations for each Computer Man cell and loads the average scores back onto the disc. Subroutines (UNLOAD and OUTPUT) listed in this section perform the essential functions of the program.

<sup>3.</sup> W. Lloyd Campbell, Glenn A. Beck, BRLESC I/II FORTRAN, Technical Report No. 5, Aberdeen Proving Ground, MD 1970. (AD #704343)

# LAYOUT OF COMPUTER MAN (LETHALITY)

SLICE NO.	ANATOMICAL SECTION	DISC RECORD NO.
(1 - 28)	Legs	1
(29-33 ) (34-36 ) (37-56)	Legs Legs, Arms Arms, Torso	2
(57-64) (65-82) (83-84)	Arms, Torso Head Dummy Slices	<b>3</b>
83-84		
65-82		3
37-64		2
34-36	HI	IW
1-33		

Figure 11. A Representation of the Disc Structure of the Computer Man

### 2. Main Routine. Definition of symbols and matrices.

M: position in subroutine (PACK, UNPACK) that is being loaded or unloaded with a score. It is synonymous to the doctors' interpretation number, M = 1,2,3

L: relative disc record number, L = 1,2,3

K: slice number within any record, K = 1-28

NDE: number of doctor evaluations provided for this time frame.

NTEST: sample selection flag. If this flag is set, the scores stored on disc in Vector (10) array are printed out for a cell with preassigned (I,J,K) coordinates.

MAN(50,35,28): target matrix in which one-third (one record of the Computer Man description for an individual assessment) is stored.

PLANE1(50,35): work array containing the slice by slice description of the Computer Man.

PLANE2(50,35): work array necessary for temporary storage of scores.

VECTOR(10): array utilized by subroutines (LOAD, UNLOAD) for storage of unpacked scores.

PROCEDURE: Initially this subroutine erases each record file before disc writing begins. The cell description of the Computer Man is transferred from tape to disc for each doctors' interpretation (M) and proceeds as follows: The head, neck and upper portion of the torso, slices (1-26), are read into active memory (PLANE1(50,35)) via (SUBROUTINE INPUT). Each integral score in each slice description is packed into the (M)th position of a word (SUBROUTINE LOAD) and this word is stored as an entry in the array MAN(50,35,28). The first 26 slices are transferred to disc and stored in the highest record on file. This action provides for two dummy slices required to complete the third section.\* The initial portion of the second section, slices (27-44), is loaded onto disc in the same fashion as section one was loaded. The remaining slices, slices (50-113), are descriptions of the Computer Man's arms and legs and are dealt with in a different fashion. At this point the partial disc description of the Computer Man is read back into core, one section at a time, beginning with the highest record.

the terms section, record and cube are synonymous in useage.

The arm and leg slices which are present in each section are read in from tape, reflected (SUBROUTINE REFLECT1, REFLECT2), to generate an identical set of scores relating to the opposite arm and leg, and finally attached to the body segments that appear in the same section (SUBROUTINE GRAFT). The section currently loaded in core is written back onto disc and the section that follows is read in. This is done for the three sections that contain the man. The above procedure is repeated until all doctor evaluations have been loaded.

It is important to understand that the highest disc record (3) must be loaded first, followed by disc record (2) and disc record (1) respectively. This is necessary to ensure that the direction in which indexing is conducted in the output subroutine  $(Z=1,2,3,\ldots 84)$  is in agreement with the manner in which the Computer Man is positioned in the xyz coordinate system.

- 3. <u>Subroutine LOAD</u>. This subroutine packs all doctor's scores pertaining to a particular cell into one word and stores this word as an entry in the array MAN(I,J,K). This is done for the three sections required to describe the Computer Man.
- 4. Subroutine GRAFT. This subroutine is used to attach the Computer Man's arm and leg slices to their adjoining segments of the body. It can graft any slice onto another slice. If an overlap between body segments occurs on any integrated slice, the more critical score is kept.
- 5. <u>Subroutine INPUT</u>. This subroutine reads the card description of the Computer Man from tape and places it in active memory in a work array PLANE1(50,35) for manipulation and assignment onto disc. When reading is completed the current slice number (NUM) is printed out. The arguments involved in reading are defined as follows:
  - (1) NUM = slice or plane number.
  - (2) MRX = maximum number of rows for this slice.
  - (3) MNR = minimum number of rows for this slice.
  - (4) MXC = maximum number of columns for this slice.
  - (5) MNC = minimum number of columns for this slice.
  - (6) PLANE1(50,35) contains the doctors' evaluation for each cell on a given slice.
- 6. <u>Subroutine REFLECT1</u>. This subroutine reflects the left arm slices to generate right arm slices. The y axis and the line X=50 are used as reference points. It is called each time a new arm slice is read in.

- 7. Subroutine REFLECT2: This subroutine reflects the left leg slices to generate right leg slices. The y axis and the line X=50 are used as reference points. It, also, is called each time a new leg slice is read in.
- 8. Subroutine UNLOAD. This subroutine unpacks the Computer Man description and is used in conjunction with subroutine OUTPUT whenever a Computer Man printout is required. All doctors' evaluations assigned to each individual cell are stored and packed in one word on disc. The packed scores associated with each cell are expanded into an array (VECTOR) with one evaluation per word. The scores presented in this aray are averaged (rounded to the nearest integer) and this average score is stored in the tenth position. At this point, if NTEST is set, each score in VECTOR array with cell coordinates (15,15,15) are printed out in order to check individual scores and verify averaging calculation. The scores in VECTOR are repacked into one word and this entry is loaded back into MAN(50,35,28). Subsequently, the main routine will transfer both the individual and average scores back onto disc. The average scores, being representative of all doctors' assessments, are reserved for utilization in subroutine OUTPUT.

Space is provided for assignments of up to nine doctors' evaluations for each cell defined. The only programming change required is to update a data card listed in the main program, /NDE/(number of doctors' evaluations). This change will calculate the correct average score if the number of doctors' evaluations increase. The Computer Man configuration is constructed in three dimensions in this fashion for each cross section of the human anatomy defined. This subroutine is called three times since the target description is assigned to three records.

9. Subroutine OUTPUT. This subroutine outputs the disc description of the Computer Man in numeric representation on an xy plane for each slice defined. The target description is stored on disc in expanded rather than compressed format as is on tape. Thus words used to indicate air space internal to the Computer Man box are included and scored as zeros.

Also, this subroutine shifts the data such that the scores can be printed out in the range indicated in Table II.

Table II

Value Stored on Disc	Computer Man Listing
0	Blank
2	1 → minimum score
3	2
4	3
<b>5</b> ့	4
6	5
7	6
8	<b>7</b>
9	8
10	9
11 .	0 -> maximum score

This can be accomplished easily if the converted scores are translated into their character representation and printed out under A2 format. Care must be utilized in calculating (K), the pointer to the numeric list where character entries are stored. If erroneous data is transferred onto disc due to missed punched cards, an exceedingly large index could result which would point to a location outside the boundary of the character array resulting in erroneous output. Therefore it is essential to check the value of K to ensure that it is within limits.

It is important to note that in this subroutine for the Computer Man to be assembled in its correct perspective in reference to the xy axis, all DO loops that control output must decrement instead of increment. This is done to compensate for the fact that the lineprinter cannot start printing at the bottom of a page and work up, only from the top and work down.

### B. Change Value Program

1. <u>Discussion</u>. The change value program was written to modify entrees in the disc description. It should be used when the number of scored cells that require modification are relatively few. It is a convenient tool, particularly in cases where doctor interpretations are missing (princiaplly with cells comprising the perimeter of the torso) and where erroneous data is detected. The maximum number of points that this program can accommodate is 10; but the program can be easily

modified to accommodate a larger number of cells. If, however, it is desired to modify entire slices it is more practical to make the necessary corrections in the card description and rerun the lethality disc load program.

### 2. Main Routine. Inputs required:

MAXPTS: total number of points to be modified.

DOCINT(10): doctor interpretation numbers.

IREC(10): relative record numbers (1-3).

ISLICE(10): slice numbers (1-82); i.e., K-coordinates.

NEWVAL(10): value of new scores (1-10).

IX(10) : I-coordinate associated with each modified score.

IY(10) : J-coordinate associated with each modified score.

The input parameters are specified in data statements; as such read and format statements are not necessary.

### Matrices required:

MAN(50,35,28): Computer Man section currently loaded.

PLANE2(50,35): work array associated with original slice.

PLANE (50, 35): work array that contains updated value.

A list of program instructions to be executed for each score requiring modification is given as follows:

- (1) utilizing data input, read in correct disc record.
- (2) store slice number, doctor interpretation number, and (I,J) coordinates for subsequent use.
- (3) unpack doctors score from MAN(I,J,K).
- (4) store in output buffer (PLANE(I,J)).
- (5) print out slice description with original score.
- (6) increment updated score.

- (7) Print out slice description with updated score.
- (8) Load target matrix, MAN(I,J,K) back onto disc.

When the loop, (DO 100 N=1, MAXPTS) has been completed all scores input have been modified. Program flow charts and listings are provided in Appendix  $^{\rm D}$ .

3. <u>Subroutines</u>. The subroutines used in this program (LOAD, UNLOAD, OUTPUT) are duplicates of the subroutines used in the lethality disc load program and therefore will not be discussed here.

### C. Tape Translation Program

- 1. General. The purpose of the tape translation program is three-fold. It converts the tape image of the card description of the Computer Man into a more acceptable form for disc storage. It tests first card parameters for consistency and makes corrections, when errors are detected and can be corrected. It contains provisions which allow corrections to be input by the programmer.
- 2. <u>Inputs</u>. The following correction cards apply when corrections are to be input by the programmer. If corrections are necessary, set CORRECTION = . TRUE .. A single correction card will be included for each line that requires a change. If it is necessary to change a first card parameter, then two cards are required as outlined below.

CARD 1 INDEX1, INDEX2, ITEM, JUMP, INDEX3

Format (515)

INDEX1 - the slice number to be changed.

INDEX2 - argument index number on the score card.

ITEM - the new value it is to assume.

JUMP - the line number relative to the previous first card, i.e., first card = 1.

INDEX3 - action flag.

INDEX3=8 - change a single entry.

INDEX3=9 - insert a new first card described by the next card.

CARD 2 ROW(I), I=1,8

Format (13, 12, 414, 4X, 214)

# INDEX3=10 - apply no more corrections

# 3. Definitions of Variables and Matrices.

ROW(I), I=1,25 - this array contains slice data.

If the card read is a first card then the following is true:

ROW(1) - slice number (1-113)

ROW(2) - (-1)

ROW(3) - starting row number

ROW(4) - finishing row number

ROW(5) - starting column number

ROW(6) - finishing column number

ROW(7) - number of columns

ROW(8) - number of rows

ROW(9) - unused

ROW(25) - unused

If the card read is a portion of the cell description then the following is true:

ROW(1) - slice number (1-113)

ROW(2) - 1 or 2

ROW(3) - lethality score

ROW(25) - lethality score

NEWROW(I), I=1,8 - this array contains the first card entries input by the programmer.

KARD - the number of lines (score cards) read for a given cross section.

- NUMCARDS number of even cards for a given row description (an even card consists of a fill 23 entries).
- RES number of left over entries for a given row description (1-22).
- CORRECTION correlation flag indicator. If corrections are to be entered CORRECTION is set to TRUE.
- FLAG correction completion flag. When FLAG = TRUE all correction cards have been read.
- 4. <u>Procedure</u>. Each slice description is read in from the input tape containing the card description of the Computer Man. Tape reading is performed on a line by line basis inasmuch as there is a one to one correspondence between cards in the card file and lines in the tape file.

The status of CORRECTION is an input parameter. FLAG is initialized FALSE in the program.

The program prints the heading for the output listing in the following format.

'ROW AND COLUMN ARE A CHECK ON THE PARAMETERS THAT POSITION THE SUB-MATRIX WITHIN THE SLICE'

'THIS PROGRAM EDITS THE FIRST CARD PARAMETERS'

If changes in the slice arguments or cell description are to be made, correction cards are read in at this point.

The positioning parameters on each first card entry are tested by using the following set of algebraic equations.

TEMP = ROW(8) - ROW(4) + ROW(3) - 1 (row count).

TEMP = ROW(7) - ROW(6) + ROW(5) - 1 (column count).

The error (TEMP) of each row and column count is calculated and printed out in the following manner:

'SLICE' K 'ROW COUNT OFF BY' TEMP.

'SLICE' K 'COLUMN COUNT OFF BY' TEMP.

Where K is equal to the slice number specified in ROW(1) and TEMP is the amount (more or less), the calculated row and column counts differ from the values specified in ROW(7) and ROW(8). If TEMP is negative,

the finishing row or column must have the absolute value of the error added to it; if positive, the difference is subtracted from it. This feature is important inasmuch as the positioning parameters control how the Computer Man is stacked. An error indicates the possibility that a row or column would be shaved off the cross section when it is read into A(I,J). The finishing row and column parameters are corrected, if in error. The number of even cards (NUMCARDS) are calculated for a given row in the slice description along with the number of left over entries (RES). NUMCARDS and RES are constant for all rows defined on a given slice. At this point a check is made to see if any default conditions exist. Default conditions are defined as follows:

- (1)  $ROW(2) \neq (-1)$ .
- (2) The calculated number of score positions does not agree with the specified number given in ROW(7).

A default condition will print out an error message in the following format and terminate execution of the program.

ITEM: xxxERRORxxxCARD CHECK	<del></del>
COMPUTED NUMBER OF ENTRIES	
INPUT NUMBER OF ENTRIES	ON SLICE
COMPUTER NUMBER OF CARDS	WITH LEFTOVER

If a default condition does not exist the following message is printed indicating that the slice arguments are acceptable.

'NUMBER OF EVEN CARDS PER ROW (NUMCARDS) WITH RES LEFT OVER'

The program proceeds to read in the succeeding scores associated with the first card parameters in question. If a correction is indicated for a score positioned on the line currently being read, it is inserted at this point.

Each score is converted from its character representation to its integer representation via (DECODE) and incremented. This shifts the range of scores to (2-11). Also, it is necessary at this point to remove each 'B', otherwise when read into BRLESC memory a -23 would appear in the word position where each 'B' occurred causing difficulties in loading the cell description onto disc. Therefore 'B' is converted to 0. As each line is completed the converted version is written onto the output tape.

The output tape should be tabbed fully to check for discrepancies. If errors are detected, a set of correction cards should be made and the program should be run with CORRECTION equal .TRUE..

### D. Computer Man Delineation Program

1. General. There are many instances in personnel vulnerability studies where our interest is focused around vital organs or regions of the body apart from the body as a whole. An example is the design of helmets where improved protective characteristics could ultimately reduce casualties resulting from head injuries. In applying the Computer Man modeling technique, we would only be concerned with the rays which penetrate the head slices of the Computer Man. This program was written for this purpose. It delineates any desired region of any given dimensions inside the body box and loads only the delineated region onto a new disc file. A modification of the ray tracing program (RAYMAN) will assess the disc file containing the modified Computer Man description. Any number of sections can be used to approximate the desired region with two restrictions: (1) the coordinates chosen for each section must define the vertices of a rectangular box, and (2) in generating each section:

I2 > I1

J2 > J1

K2 > K1

### 2. Inputs.

CARD 1 NUM, ISECT, ISL

NUM - the number of rectangular blocks required to construct the delineated region.

ISECT - the number of disc records which comprise the Computer Man.

ISL - the number of slices per record.

Format (313)

CARD 2 I1, I2, J1, J2, K1, K2

CARD (NUM+1)

Il - minimum x coordinate

12 - maximum x coordinate

J1 - minimum y coordinate

J2 - maximum y coordinate

K1 - minimum z coordinate

K2 - maximum z coordinate

Format (613)

Note: for NUM > 1 the cards must be stacked in ascending order with respect to z coordinates.

# 3. Arrays and Variables.

KMAX - the last delineated slice in a section.

KMIN - the first delineated slice in a section.

NSLICE(N), N=1,14 - each location in this array contains the number of delineated slices present in each section.

KNUM(N),N=1,14 - each location in this array contains the address (slice number) where delineation starts relative to the beginning of each section. It is synonymous in meaning to KMIN.

KMR1(N),N=1,84 - this array is used to designate which slices of the Computer Man are delineated.

KMR2(N),N=1,84 - this array is used to designate where section boundaries occur.

MAN1(I,J,K) - Computer Man array.

4. Main Program. Initially the arrays KNUM, NSLICE, KMR1, KMR2 and the disc file reserved for the modified Computer Man description are erased. The program reads the input parameters defined on Card 1 which defines the upper limit (NUM) for indexing delineated regions. The program reads in the card containing the coordinates for the first delineated section. The contents of KNUM, NSLICE, KMR1, KMR2 are calculated (Subroutine CALSCE) and printed out. The cells which fall within the region defined by I1, I2, J1, J2 inclusive are loaded into MAN1(I,J,K) for each slice that is delineated within the section currently in core. The maximum and minimum values of K (KMAX, KMIN) which define the slice boundaries for each section are retrieved from KNUM and NSLICE. All DO loops will be executed once if the upper and lower limits are equal. The record currently loaded in core is transferred to its proper location in the new disc file.

The procedure is repeated until the number of input cards read containing section boundary coordinates is equal to the number of defined sections (NUM). A slice by slice description of the delineated version of the Computer Man model is printed out.

- 5. Subroutine CALSE. This subroutine sets slice markers in KMR1 and section boundary markers in KMR2. The number of delineated slices (KCOUNT) which are present in each section within the region defined by K2-K1 are counted and the relative address in each section (KN) where the first delineated slice occurs is stored.
- 6. <u>Subroutine INSERT</u>. This subroutine inserts the values (KCOUNT and KN) calculated in subroutine CALSCE in the arrays KNUM and NSLICE. KSECT points to the position in KNUM and NSLICE where KCOUNT and KN are stored. KCOUNT and KN are initialized before tracking begins in the next section. This subroutine is called each time a section crossing occurs provided the sections fall within the delineated region.

# E. Instructions for Using Lethality Programs

- 1. Generate a card file as described in IV-A.
- 2-A. Load the card file onto tape.
- 2-B. Tab the tape version of the card description and correct errors in the card file.
- 2-C. Reload card file onto tape.
- 3-A. Using the tape version of the card description as input and a second tape as output, run the tape translation program with the correction status flag set.FALSE..
- 3-B. Tab out tape fully. If errors are detected, rerun program with correction cards inserted and the correction status flag set .TRUE..
- 4. With the tape containing the translated version of the card description as input, run the disc load program. Examine individual doctor's evaluations.
- 5. If errors exist, run the change value program to correct errors in evaluations.
- 6. Run average score program.
- 7. If an examination of body parts is required, run Computer Man delineation program.

#### VI. COMPUTER MAN PROGRAMS - INCAPACITATION

The programs which comprise the incapacitation section involve translating the incapacitation model into a form analogous to the lethality model and redefining the disc file structure to reduce disc access time.

The incapacitation section consists of the following three programs, Model Repositioning, Foot Slice Addition, and Mosaic Printout.\* The flow charts and listings associated with these programs are listed in Appendix D.

# A. Model Repositioning

1. Discussion. Unlike the lethality model which was generated inhouse, the incapacitation model was generated earlier and was based upon the casualty criteria described by Allen and Sperrazza. The source of the model was a tape consisting of codes which identified anatomical tissues. These codes were organized on tape in accordance with the tape description generated for lethality as outlined in Section IV. The original program which assembled and loaded the incapacitation man onto disc positioned the Computer Man standing in a left-hand coordinate system. This program repositions the Computer Man to match that of the lethality model (right-hand coordinate system) and in doing so enable the model to interface with the shotline trace program (RAYMAN) developed by BRL. In addition the file and record lengths were redefined to reduce the I/O required by RAYMAN.

# 2. Definition of Matrices.

WORK(55,110) work arrays associated with original model WORK1(55,110) required for manipulation and storage of codes.

MAN1(55,110) - target matrix associated with original model.

WORK3(110,55) - work array associated with reconstructed model.

<sup>\*</sup>The "Model Repositioning" and "Foot Slice Addition" programs are special purpose programs; therefore, if future incapacitation models were to be constructed using the method defined for lethality in Section IV, they would not be required.

<sup>&</sup>lt;sup>4</sup>·F. Allen and J. Sperrazza, "New Casualty Criteria for Wounding by Fragments, Ballistic Research Laboratories Report No. 996, 1956. (CONF) (AD #137681)

<sup>5.</sup> W.B. Beverly, "RAYMAN: A FORTRAN Computer Code for Tracking Rays Through a Detailed Human Phantom," USA ARRADCOM Ballistic Research Laboratory Report No. ARBRL 2030, Nov 1977. (AD #A051057)

MAN(55,110,6) target matrices associated with reconstructed MAN2(110,55,6) model.

3. Procedure. The original cell description is read in from disc and stored in MAN1(55,110). Each slice description is read individually because each slice was assigned separate records in the original model. A new work array WORK1(55,110) is loaded with the cell descriptions contained in MAN1; in loading this array indexing is conducted in the J dimension in reverse order. Next, WORK2(55,110) is loaded from WORK1(55,110) with indexing conducted in the I dimension in reverse order. Reversing the loading order of tissue codes in both the I and J dimensions, in effect, faces the Computer Man in the opposite direction.

The second step required is to invert the Computer Man. This is done by reversing the stacking order. Concurrently, the slice descriptions are regrouped and buffered in the array MAN(55,110,6) where 55x110x6 defines the storage capacity required for one record in the translated version. The following chart relates the disc file structure of the reconstructed and original models.

Table 3

# DISC FILE CONVERSION CHART

### RECORDS

Note: As illustrated the new model is composed of 14 sections (records) as opposed to 76; each record consisting of six slices.

The third step required in the transformation is to rotate the Computer Man 90 degrees inside the first quadrant. This is accomplished by interchanging the (I,J) coordinates of each entry in the array MAN1(J,I,K), whereby the contents of each record assumes the form designated by MAN(I,J,K).

Each record in the new file is constructed in this fashion. However, since 82 slices represent the Computer Man, 84 defines the file, it is necessary to shift the Computer Man six slices in the -z direction after the last record is loaded. This move will incorporate two dummy slices

above the head and stand the man flush on the xy plane. Provisions are included in defining the model which will allow for six additional foot slices to be added. Also, the program prints out each slice description of the reconstructed model by calling subroutine MOSAIC. Fig. 12 illustrates the disc structure of the incapacitation model after transformation is completed.

### B. Foot Slice Addition

1. <u>Description</u>. The original incapacitation model derived in VI-A. was constructed without feet due to the fact that cross sections (108-113) were not derived from cuts taken parallel to the xy plane. However, a soldier's mobility is of vital concern to infantry vulnerability analyses, thus it was deemed essential to consider the effect of wounds received in this region in our study.

The Foot Slice Addition program was written for this purpose. It attaches the foot slices provided by Eycleshymer and Schoemker onto the Computer Man and in effect stands him on his toes.

The program is set up such that it could be easily modified to add or delete tissue codes in any cross section.

2. <u>Main Routine</u>. The following instructions read in the foot slices:

DO 2000 SLICE = 1,6

READ (5,100) CARDNUM, ARG1, ARG2, ARG3, ARG4, ARG5, ARG6

100 FORMAT (13,1X,614)

READ (5,101) ARG7, ARG8, ARG9, (ARRAY(N), N = 1,23)

101 FORMAT (I2,1X,I2,1X,I2,23I3)

where:

ARG1 = starting position of submatrix on y axis

ARG2 = end position of submatrix on y axis

ARG3 = starting position of submatrix on x axis

ARG4 = end position of submatrix on x axis

ARG5 = number of columns for submatrix

ARG6 = number of rows for submatrix

# LAYOUT OF COMPUTER MAN (INCAPACITATION)

SLICE NO.	ANATOMICAL S	ECTION	DISC RECORD	NO.
(1-6)	FEET		1	
(7-33)	LEGS		2,-6	
(34-39)	ARMS, LEGS	5	6,- 7	
(40-59)	ARMS, TOR	SO	7, -10	
(60-64)	TORSO		10,-11	
(65-82)	HEAD		11,-14	
(83 -84)	DUMMY SL	ICES	14	
83 - 84			14	
		<u> </u>		
65-82			13	
			12	
			11	
			10	
37-64			9	
			8	
			7	
34-36	-H-1 [	IH	6	
	/		5	
	1/[		4	
1 -33			3	
			2	
_,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	$\forall$	$\Box$	1	

Figure 12. A Representation of the Disc Structure of the Computer Man

ARG7, ARG8, ARG9 pertain to each individual row of tissue codes.

ARG7 = y coordinate of row

ARG8 = starting x coordinate of tissue codes

ARG9 = x coordinate where tissue codes end

CARDNUM = slice number 1-113

ARRAY(23) = tissue code input list

WORK1(55,110) = temporary storage of slice description

MAN3(110,55,6) = target matrix

The tissue codes are read into ARRAY (24) rowwise in accordance with format 101.

The following steps construct and position the submatrix.

- 1. The entries in ARRAY are shifted upwards such that ARRAY(1) contains the first valid (non-zero) entry.
- 2. The tissue codes are transferred to and positioned in WORK1(55,110). The arguments ARG7, ARG8, ARG9 define the location and bounds of the submatrix.
- 3. The slice description is reflected about the midpoint of the x axis, line X=55, to generate tissue codes pertaining to the opposite foot.
  - 4. The submatrix WORK1 is copied onto the main target matrix.
- 5. The steps outlined in the Model Repositioning Program (Section VI-A) are duplicated.
- 6. The foot slices are loaded onto the disc version of the reconstructed model.
  - 7. Subroutine MOSAIC is called to print out each slice.
- 8. The incapacitation reconstruction program is rerun to verify that both programs interface properly.

# C. Subroutine MOSAIC (KSI,I)

1. <u>Discussion</u>. The function of subroutine MOSAIC is to print out each cross section of the incapacitation model in its mosaic characterization. A list of the symbols which appear in the MOSAIC printout followed by a list of tissue codes identified by each symbol is included in Appendix A for reference.

# 2. Definition of Variables and Matrices.

KSI(110,55) - this array contains the tissue codes that make up the cell description of the cross section currently processed.

GRID(110,55) - this is the output array for the incapacitation model.

CODE(200) - this array contains the list of tissue codes defined to describe the Computer Man. The codes range in value (2-200).

SYMBOL(200) - the first 187 elements contain the Holerith representation of the characters used to identify tissue codes.

ORD(112) - this array is filled with 112 periods which serve as the upper and lower borders for each cross section.

N - the number of valid tissue codes defined for incapacitation (181).

I - the cross-section number (1-84).

3. Procedure. The subroutine indexes through KSI(110,55) checking for a match in tissue codes between each element in KSI(110,55) and CODE (200). Where a match is encountered, the symbol chosen to identify the tissue code is taken from SYMBOL(200) and place in GRID(110,55) in the position that corresponds to the index (I,J) in the array KSI(110,55). This is done for each element in KSI(110,55). A blank character is inserted where non-tissue codes are encountered. After each row in the output matrix GRID(110,55) has been filled, the entire slice is printed out under A2 format. Each slice description is positioned along an xy axis enclosed in a border with the cross-section number printed below the x axis. In order to assist in marking off cell distances periods are inserted at equal intervals along both axes where tissue codes do not exist.

It is important to note, as was the case with lethality, that in printing out each slice row indexing must be conducted in reverse order (i.e., ROW(55), (54), (53),...(1)) so that the Computer Man can be printed out in its correct perspective (i.e., facing parallel to and in the direction of the +y axis).

## APPENDIX A

DESCRIPTION OF ANATOMICAL TISSUES WHICH DEFINE THE COMPUTER MAN



CODE	SYMBOL	SECTION	STRUCTURE
2	9	1-113	RUBCHTANEOLS
3		1-6	SCALP
<u>     4                               </u>		1-12	SKULL
5	K	1-12	SKULL
6	Ţ	1-12	BRAIN- (FXCFPT FRONTAL LOSE)
7	ŭ	1-8	RRAIN (FRONTAL LORE)
<del></del>	Y	7-16 7-16	FACE (SOFT TISSUE)
9	ė.	7-16	FACE (CARC RONE) FACE (CART RONE)
10	— <del>;</del> —		EVE (EXCEPT EVERALL AND OPTIC NERVE)
24	À	7-9	FYERALL AND OFFIC NERVE
11	s	7-18	HUSCLE
12	. <b>D</b>	18-20	NERVE C-5.6.7
13	- F	11-19	PHARYNY
14.	G	17-19	LARYNX
179	— н	17	HYOID RONE
16	- <u>k</u>	13-20	VERTERRA (SPINAL AND TRANSVERSE PROCESSES) VERTERRA (SPINAL AND TRANSVERSE PROCESSES)
17	î	12-21	VERTERRA (ARCH AND BEDY)
18	— <u>;</u> —	12-21	VERTERRA (ARCH AND BODY)
173	x ·	12-21	BONE HITHIN 1 CH OF SPINAL COLUMN
174	— ĉ —	12-21	HONE WITHIN & CH OF SPINAL COLUMN
19	v	13-21	SPINAL CORD
20	B	1-10	VASCILAR
20		1 = 8	SUPERIOR SAGGITAL SINUS
50	- 3	3	SUPR CERFARAL SINUS
50	!	2-3	MINDLE CEREPRAL SINUS
20		2-6,9	MINDLE MENINGEAL SINUS
50		9-11	TRANSVERSE MENINGEAL SINUS
20	Ř	9-18	SINUS PETROSUS INFERIOR
<u>21</u>	— <u>"</u> —–		VASCULAR INTERIOR CARCTIO
21	N	11-17	EXTERIOR CARCILD
21	N	18	COMMON CAROTID
22	M	8-18	VASCHE AR
5.5		8-11	SUPERFICIAL TEMPORAL
2.2	M	11.13-15	OCCIPITAL
55	W	11.12	ANGULAR
55	M	12.13	POST AURIC
22		13117	ANT FACTAL
<del></del>	M	14-17	EXT MAYTILARY GENU PROFUNCAS
22		14-18	SURMENTAL
<del>22</del>	— <u>~</u> —	16,17	ANT JURII AR
22	Ä	18	COMM FACTAL
52	M		V.COMMUNICANS
5.5	M	17	POST. FACIAL
25		11-18	VASCULAR
25	0	11-18	THE SUGULAR
52	9	11,13-18	EXT JUGULAR
55	<u> </u>	22-27	VASCULAR

TISSUE

TISSUE	I D SYMBOL	CROSS SECTION	ANATOMICAL STRUCTURE
25	0	12-18	VERTEBRAL
25	_ 0	17-18	SUPER THYROID
26	_ 2	19-27	MUSCLE
27	3	19-27	PHRENIC NERVE
28	•	21-23	NEAN
28	4	21-25	HRACHTAL PLEXIIS
<u>28</u> 28	-4-	21-23 21-23	ULNAR HALTAL
28	7	21-23	MEDIAN
29	- 5	21-31	VEHILBRA (TRANSVERSE AND SPINAL PROCESS)
30	6	21-31	VERTIBERA (TRANSVERSE AND SPINAL PROCESS)
31	7	22-31	VERTIBRA (ARCH AND BODY)
32	- <del>§</del>	22-31	VERTFERA (ARCH AND BODY)
175	Q	22-31	HONE WITHIN 1 CM OF SPINAL COLUMN HONE WITHIN 1 CM OF SPINAL COLUMN
33-	·	22-31 22-31	SPINAL CORD
34	£	19-21	THYROID
35	- R	20-24	TRACHEA
36	· _ <u> </u>	20-28	ESUP-AGUS
37	- Y	20-21	CLAVICIE
$\frac{38}{-39}$	- U	20-21	CLAVICIE SCAPULA
40	ø	20-25	SCAPULA
41	- p	21	SHOULDER JOINT (HEAD OF HUMERUS AND ADJ SCAPULA)
42	A	21	SHOULDER JOINT (HEAD OF HUMERUS AND ADJ SCABULA)
177	- s	21	ARTICULAR SURFACE OF SHOULDER
178	_ D	21	ARTICULAR SURFACE OF SHOULDER
43	_ t	22-23	HUMERUS (PROX SHAFT)
44	- <sup>G</sup>	22-23	HUMERUS (PROX SHAFT)
46	;	21-33 21-33	R18 R16
47	- ĸ	21-28	LUNG
4.8.	L	27-31	DIAPHRAGM
49	_ z	25-27	HEART (EPICARDIUM AND MYDCARDNM)
50	_ ×	25-27	HEART (CHAMBERS)
51	ç	19-21	VASCULAR
<del>-51</del> -	- c	19-21	!N) JUGULAR EXT JUGULAR
51	2	20	INF THYROID
71	- £ —-	19-20	VERTEBRAL.
52	V	19-27	VASCULAR
25	_ v	24-27	PULMUNARY
52	v	25-27	COHONARY
52 52	v	24-27	AZYGOS VENA CAVA
-52-	- <u>v</u>	21-22	SUR CLAVIAN
52	v	19-21	COMMON CAROTID
53	В	23-27	STERNUM
54	_ N	22-27	VASCULAR
54	. – N – – –	55-53	AXILLARY
54	N	55-51	INT MAMMARY
73	_ M	30	ARCHOFORMIS

TISSUE	ID SYMBOL	CROSS SECTION	ANATOMICAL STRUCTURE
55	0	23-27	AORTA
	_ o	55	TNNONINATE
56	- 2	28-32	STOMACH
58	3	28-34	LIVER
	- 4	52-33	TALL BLADDER
60	5	28-29	SPLEEN
61	- 6	29-32	PANCREAS
62	_ 7	29-30	ADRENALS
63	•	29-33	KIDNEY
65	- 2	$\frac{31-40}{32-37}$	VERTEBRA (SPINAL AND TRANSVERSE PROCESS)
66	_ w	32-37	VERTERRA (SPINAL AND TRANSVERSE PROCESS)
67	- E	32-37	VERTERRA (ARCH AND BODY)
6.5	_ R	32-37	VERTERRA (ARCH AND RODY)
75	_ 1	32-35	VERTERRA (WITHIN 1 CH OF SPINAL CHORD)
<del></del>	– Ÿ –	32+37	VERTEBRAL CANAL
71	ĭ	28-35 28-35	MUSCLE VASCULAR (ADRTA)
72	- ø	28-35	VASCULAR
72	_ Ø	28-30	HEPATIC
72	- 0	29-32	PENAL
72	_ •	31	GASTRODUCTENAL
72	•	30-33	PORTAL
	- I	$\frac{31}{31-33}$	CYSTIC ESFT GOLIC
72	• •	31-32	RIGHT GASTRIC
7 2	- ø	31	MIDDLE CCLIC
72	_ ø	31	PYLORIC COLIC
72	_ ø	32-35	SPERMATIC
72	_ ø	33-35	JENAL
72	-8-	34-35	RIGHT COLIC INTESTINAL
	- ø	35	A ILEAG
72	Ø	35	ILEO COLTO
72	- o	35	SUPERIOR HEMP
72	_ Ø	35	SIGMOIDAL
72	8	28	INT MAMMARY
<del></del>	_ ~~~~	32 28-35	PANCREAT COUNTENAL VASCULAR
73	P	28-30	INF PHRENIC
73	— è ——	28-30	INTERCOSTALS
73	P	28-30	HEMI A 7 YGOS
73	_,	29	ESOPHAGFAL
73	_ ′′	28	SUP SUPPARENAL
73 73	P	28	GASTRIC PREVIS PERECARDIA PERENIC
73		29	INF SUPRARENAL
73	ρ	29_30	CORONARY VENTRICULI
	— р ——	29.	MUSCULOPERENTO
73	_ p	30-31	SUPRARENAL
96	— р ——	30	INTERLOSICARIS
	_ ^	39-42	OBTURATOR

TISSUE	I D SYMBOL	CROSS SECTION	ANATOMICAL STRUCTURE
73	• •	31 34-32	LUMBALIS
73	- p		LUNH ASC
73		35 25-37	ILEOLUMPALIS VASCULAR
74	<b>S S</b>	28-35	VENA CAVA
7.4	- š	29-30	LEFT GASTRIC
. 74	Š	29-31	SPIENIC
74	- s	32-34	SUPERIOR MESENTERIC
74	- §	32-35	INF MESENTIVIC
74	- s	28-29	AZYGOS
76	_ D	34-44	NERVE-3,4 LUMBAR" LUMBROSACRAL 1,2.3 SACRAL. FEMORAL, OBTURATOR
77	_ F	40-44	NERVE SCIATIC
$\frac{78}{79}$	_G	37-40	VERTEBRA (SACRUM)
180	_ H	37-40 38-40	VENTEBRA (SACRUM) BONF (1 CM OR LESS FROM CANDA EQUINA)
80	- <u>*</u>	41	VERTEBRA (COCCYX)
81	L	41	VERTERRA (COCCYX)
82	_ Z	35~39	VEHTEBRA (WING OF ILIUM)
83	_ X	35-39	VERTEBRA (WING OF ILIUM)
84	_ c	41-43	PUBIS
85	š	41-43	PUHIS ISCHTUM
87	ŭ	42-43	ISCH   UM
88	_W	40-41	HIP OINT
89	_ 0	40-41	HIP JOINT
99	1	40-41	ARTICULAR SURFACE OF HIP JOINT
<u> 100</u> 90	- 3	40-41	AR'IGULAR SURFACE OF HIP JOINT
91	4	42-44	FEMUR
<del> 9 2 -</del> -	- 5	36-44	MUSCLE
93	6	41-42	URINARY BLADDER AND URETHRA
94	- <sub>7</sub>	42-44	EXI GENITALIA
95	8	36-44	VASCULAR
95	8	36	YENA CAVA
95	- <sup>8</sup>	36-37	COMM ILIAC
95	8	37-40 37-39	EXT ILLAC HYPOGASTRIC
95	- 8	41-44	FEMORAL
95	8.	41-44	PROFUNDA FEMORIS
96	9	36-43	VASCULAR
96	- °	36-38	ILFOCOLIC
96	9	36 36 <b>-3</b> 8	A LEAC RT COLIC
96	- <sub>9</sub>	36-38	SPERMATIC
96	9	36	INTESTINAL
96	- 9	36.37	JEJENAL
96	- 9	36-38	SIGMOIDAL
96	- 9	36-39	SUPRAHEMMORCIDAL
<del>- 96</del>	- <del>9</del>	39 40-43	SUPRA GLUTEAL THE GLUTEAL
119	_ á	60-66	VASCULAR
	_ ~		

TISSUE	SYMBOL	CROSS SECTION	ANATOMICAL STRUCTURE
76	_ •	40-43	INT PUDENAL
96	_ •	40	INF VESTOUE
96		34-34	MIN SACRAL
97	W	36-44	VASCULAR
97	_ W	41-44	SAPHRENA MARMA
97	W	36-40	INF EPIGASTRIC
97	_ W	36-38	ILFOLUMRALIS
97	W	37-39	CIRCUMFIFX ILEUM PROF
97	_ <u> </u>	38-41 41-44	LAT SACRAL PAMPINI FORM PLEXUS
	W	-	
97	-,w	42	DORSAL PENIS
97	- w	42-44	LAT CIRC FEHCRIS
97	- <del>- W</del>		PRIM PERFORONS PROF PENIS
97	W	43	PUDENAL PLEXUS
	- W		PURNIC PURAGE
***			
101	R	50-59	MUSCLE
<u>fő</u> z	- ÿ - <del></del>	50-59	NERVE - MUSCUHCCUTANEOUS ULNAM, MERIAN, RADIAL
103	ŭ	50-57	HUMERUS
104	- i —	50-57	HUMERUS
105	ø	58-59	FLEOW JOINT
106	- j	58-59	ELROW JOINT
110		58-59	ARTICULAR SURFACE OF ELBOW JOINT
111	- <u>5</u>	58-59	ARTICULAR SURFACE OF ELROW JOINT .
107	D	50-59	VASCUL AR
107	_ D	50-59	BRACHIAL
107	_ D	50-51	PROFUNDA BRACHII
108	_ F	50-59	VASCULAR
108	F	50-59	CEPHAL IC
108	- F	50-59	8ASILIC
109	G	52-59	VASCUI, AR
109	- G	52-54	SUP ULNAR COLLATERAL
109	G	52-53	MIDDLE COLLATERAL
	- G	52-55	RADIAL COLLATERAL
109	G	58-59	ULNAR RECURRENT
109	- G	58-59	RADIAL RECURRENT
109	_ <sup>G</sup>	59	INF. ULNAR CCLLATERAL
112	-н		
113	J	60-68	MUSCLE
114	- ĸ	60-68	NERVE - ULNAR. RADIAL. MEDIAN
115	L	.60-68	RADIUS AND ULNA
116	_ z	60-68	RADIUS AND ULNA
117	_ x	60-68	VASCULAR
117	_ x	60-68	RADIAL
117	_ X	60-68	ULNA
118	- <u>c</u>	60-70	VASCULAR
118	_ c	60470	BASILIC
118	_ c	60-67	CEPHALIC

TISSUE	ID SYMBOL	CROSS SECTION	ANATOMICAL STRUCTURE
-	<del>-</del>	······································	
119	- V —	60	RADIAL RECURRENT
119		60	ULNAR RECURRENT
$\frac{119}{119}$	_ <u> </u>	61	COMMON INTEROSSEUS
119	V	62-66	VOLAR INTEROSSEUS
120	_ <u>`</u>	02-00	UORSAL INTEROSSFUS
121	Ň		
122	_ M		
123	o	69-71	MUSCLE
124	1	69-71	NERVE - ULNAR, MEDIAN
125	$-\frac{2}{3}$	69	RAMILIS AND LENA
126 127	4	69	HADIUS AND ULNA
128	- <del>5</del>	70-71 70-71	COMPAL BONES
129	6	69-71	VASCULAR (ULNAR AND RADIAL)
130	- <del>,</del>		TRACOLAR TOURIST AND MAILTEE
_131	8		
132	- 9	72-75	SOFT TISSUE
133	_ <del>Q</del>	72-75	3/08
134	_ w	72-75	80 NE
$\frac{135}{136}$	- E	77.50	1 1/15 of P
137	Ť	76-92 76-86	MUSCLE NERVE - SCIATIC
138	- <del></del>	87-92	NERVE - TIBIAL, PERONEAL
139	Ú	76-87	FEMUR
140	·- ,	76-87	FEYUH
141	Ø	88-92	KNE
142	_,	88-92	KNFE
146	_^	89-91	ARTICULATING SURFACE OF KNEE
143	5	76-92	VASCULAR
$\frac{145}{143}$	- <del>s</del>	76-05	!EMPORAL
143	\$ \$	86-92 76-83	POPLITEAL PROFUNDA FEMORAL
144	- <u>5</u>	76-92	VASCULAR
144	Ď	76-92	SAPHENA MAGNA
144	_ p	86-92	SAPHENA PAPVA
145	F ·	76-92	VASCUL AR
145	F	76-92	PRIMARY PERFORATING
145	_ F	76-92	SECONDARY PERFORATING
145	F	76-92	ERTIARY PERFORATING
145	F	76-92	GENU SUPREMA
145	, F	76-92	GENU INF. MED.
147	- G	<del></del>	· · · · · · · · · · · · · · · · · · ·
149	— н	93-105	MUSCLE
150	_ /	93-97	NERVE - TIBEAL, PERONEAL
151	— ĸ	93-105	TIEIA
152	- L	93-105 93-105	FIEULA
154	X	93-105	FIGULA
	—	.3 107	

CODE	SYMBOL	SECTION	STRUCTURE
155	c	93-105	VASCHLAR
135		93	POPLITEAL
155	C	94-105	POST TIBIAL
156	- <sub>V</sub>	94-105	VASCULAR
156	V	94-104	PERONEAL
156	- v <del></del>	94-105	ANT. TIBIAL
157	•	93-105	VASCULAR (SAPHENA MAGNA
158	- N-	106-109	VASCULAR
159	M		
150	-0	106-109	MUSCLE
161	1	106-107	TIBIA
152	- <sub>2</sub>	106-107	TIRIA
163	3	106	FIBULA
164	4	106	FIRULA
165	5	107-109	TARSAL BONES
166	- 6	107-109	TARSAL PONES
167	7	106-109	VASCULAR
167		106-107	ANT. TIBIAL
167	7	106-107	POST. TIPIAL
167	_ 7	108-109	DORSALIS PEDIS
168		106-109	VASCULAR
169	- •		
170	Q	110-113	SOFT TISSUF
171	- w	. 110-113	BONE
172	3	110-113	RONE



## APPENDIX B

A SLICE BY SLICE COMPUTER DESCRIPTION OF THE INCAPACITATION MODEL



	•••••••	• • • • • • • • • • •		
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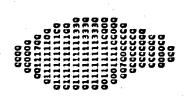
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                               Q0555555500Q
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                              90055555551119
Q111155555551QQ
                              Q1155555551111Q
Q1111555555501Q
                            . 910555555511119
Q1100555555500Q
                              900555555500119
Q0CCQQ55555590Q
                              00055555500000
00000505555000
                               CC0555595CC00Q
 0000555555000
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 909555509079
                                Q70Q05555CQQ
 00055550000
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                                  QQ05555CQQ
QQ55555CQQ
 QCC555550Q
  CQ5555500
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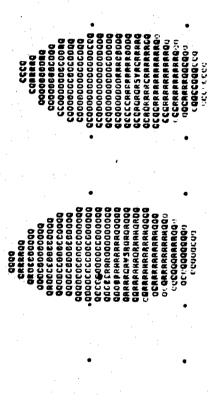
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CROSS SECTION 34

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CROSS SECTION 36

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CROSS SECTION 4:

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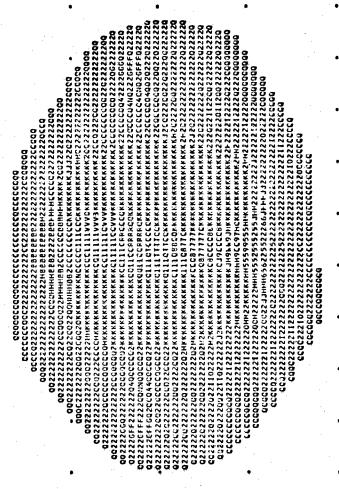
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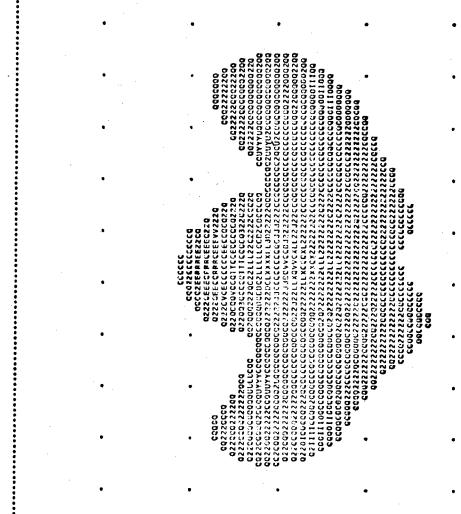
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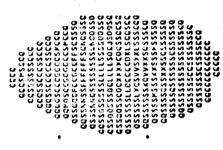


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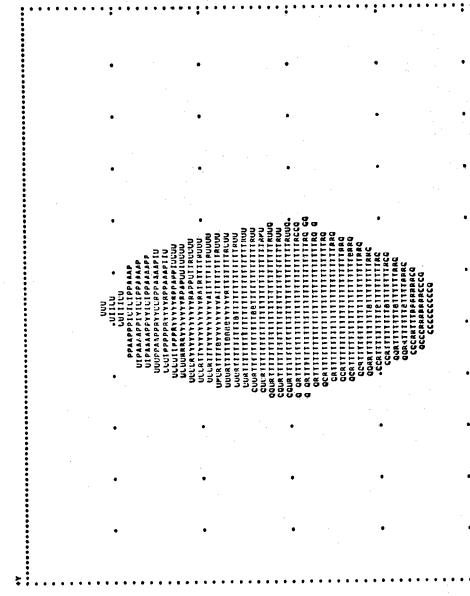
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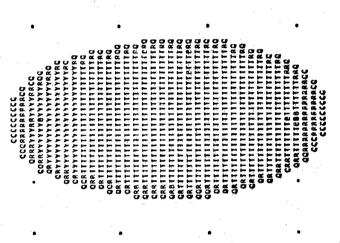


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   QRRTTTTTTTTTTTTTTTTTTTRRQ
   CORTTITUTITITITITITITERC
   CRRTITITITITITITITAC
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    CCRRTTTTTTEBTTTTTRAC
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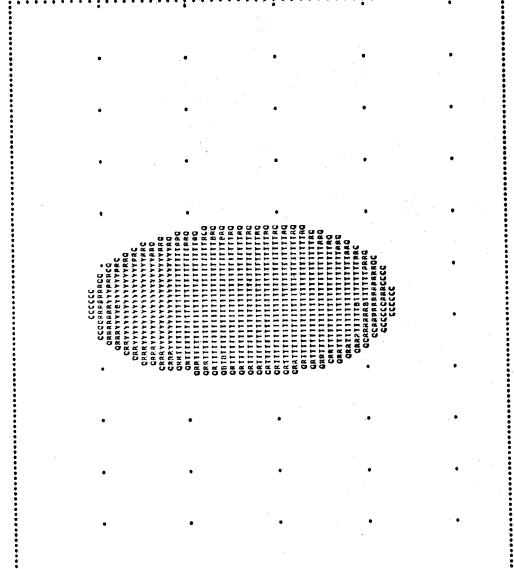
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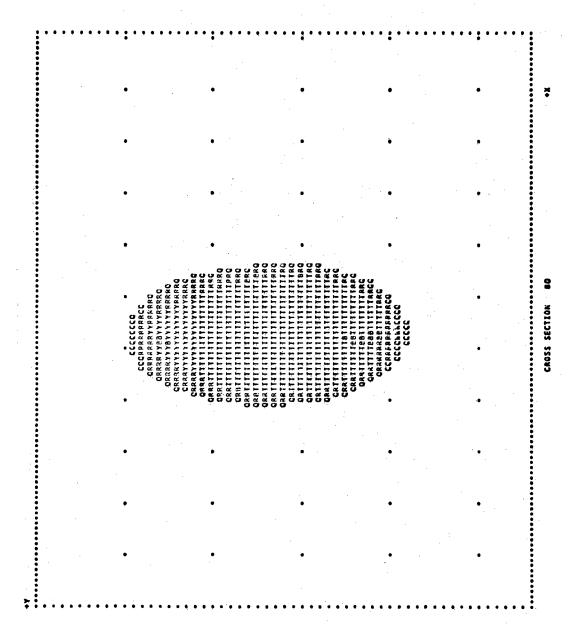
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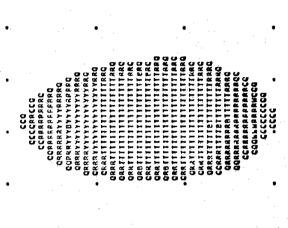




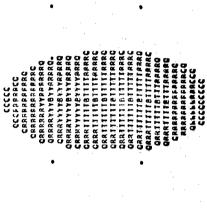






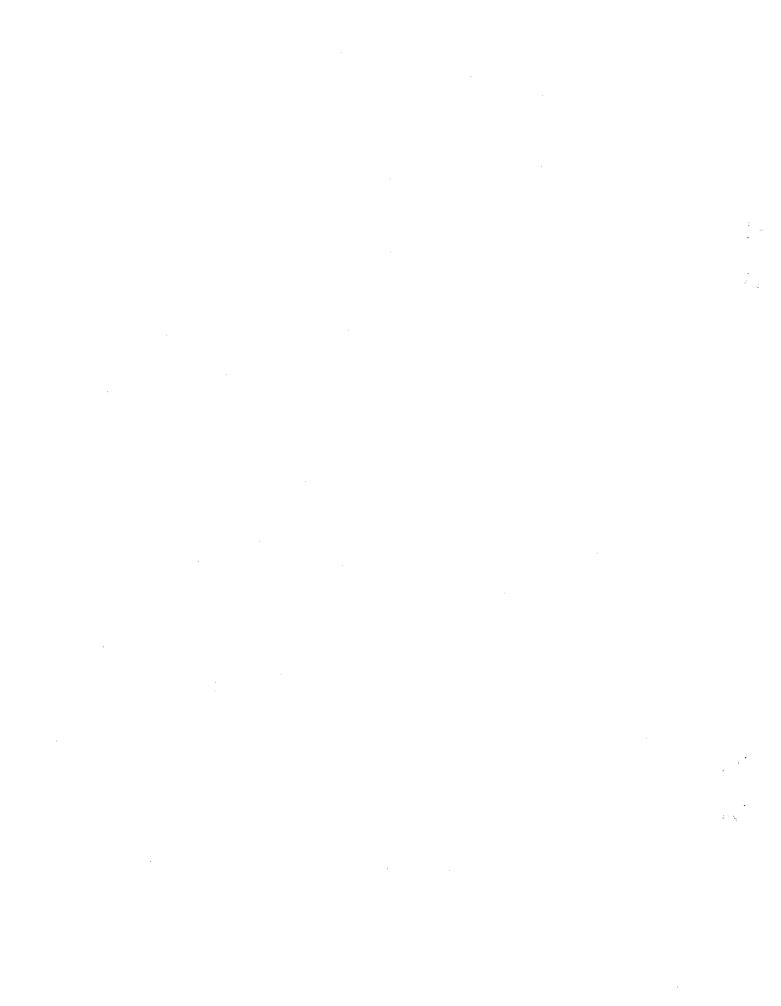






## APPENDIX C

A SLICE BY SLICE COMPUTER DESCRIPTION OF THE LETHALITY MODEL



CROSS SECTION 3 AVERAGE DOCTURS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 4 AVERAGE DOCTORS EVALUATION I HOUR ASSESSMENT

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CROSS SECTION 6
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION B AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

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CROSS SECTION 9
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 10
AVERAGE DUCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 12 AVERAGE DUCTURS EVALUATION 1 HOUR ASSESSMENT

AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

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AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 21
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 22 AVERAGE DUCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 23
AVECAGE DECTORS EVALUATION 1 HOUR ASSESSMENT

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CROSS SECTION 24
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT
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                                  1 2 2 2 2 2 1 1
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                              1 1 2 2 2 2 2 2 2 2 1 1 1 1 2 2 2 4 2 2 2 1 1
1 1 2 2 2 2 2 2 2 1 1
1 1 2 2 2 4 2 2 2 1 1
                                 111233111
1 1 1 3 3 2 1 1 1 1 1
 1133111111
                              1111113311
   11111211
                              112111111
   1111111
                                1111111
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AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 26 AVERAGE DUCTORS EVALUATION I HOUR ASSESSMENT

CROSS SECTION 29
AVERAGE DICTURS EVALUATION I HOUR ASSESSMENT

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CROSS SECTION 31 AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

CRBSS SECTION 32 AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 33 AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

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		عدو فنو فنو منو منو منو .
		، هنو منو منو منو عنو منورمتو متو مُتو منو
	• •	منو مناو منو منو غنو منو منو منو منو منو منو منو
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Ž ·		فيو فتو ميو متو يتو بيو ميو ميو پيؤ
		منو سو 闪 منو سو ښو نيو ښو ښو ښو
44		صبو عنبو منبؤ منبو عنبو عبير عبيو عبير عنبو عنبر طنبو
6	•	هنو منو فنو منو شام ميو غنم سنو منو شو شيو ميم هنم ميم
		فيو ميو ميو هيو طاق ميو فتو قبل قبو ميو ماڻو ڪِيُّ. منو
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	•	صو متو متو متو کار کار ایک شو شو متو متو متو نثو متو
100		منو منو متو بنو ضو کړي څي منو متو متو متو نيو نيو نيو
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	•	
	•	هنو شو سو منق
	•	عبو عبو ميو ميۇ
		فدو مدؤ منؤ غلاغ منو
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_		منو منو منو
, ,		gan pan

AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 37
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

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CROSS SECTION 38
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT
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CROSS SECTION 39
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

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AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT
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   よよななころことをきまままま
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   まままるままる でごるすりょう
よろとまとならととととなるまままま
さらこしょうこここここう こうこうしょきき
 しょりょうここここ こしょりょうしょう
   11~~112221半年ままま
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CROSS SECTION 42
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT
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 ままするのこののできまますままま
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11545222233111
しょしし ろうこうこうこしょりょう
ようここここここここここここ
ままままするうこと きょうこまままま
111~~~~~~~~~~~
ままましてこびこことをままままま
 よみょうころここ まままままりょ
 まままところとまままままま
```

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CROSS SECTION 43
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT
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NEED WEED WEED WEED WALL
 HHHOOOOOOOOOO
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CRDSS SECTION 44
AVERAGE DOCTORS EVALUATION I HOUR ASSESSMENT
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まままことやらこうとととととととこれることとと
ようきをきょうころこう ならょりょうき
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11 ちょう ちょう ちゅう くっと ちょう とう とりょう
しまできることでしょりもとをををををして
しょこちちきききとしころらしましまし
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CROSS SECTION 46
AVERAGE DRCTORS EVALUATION 1 HOUR ASSESSMENT
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                     HERESE SERVICE SERVICE
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                11112233333332111
               1123333333333333311
              1 1 2 3 3 3 3 3
                     3 3 3 3 3 3 3 3 3 3 3 1 1
             111111
                                      111111
  1 1 1 2 1 1 1 1 1
                                     111112111
  1111111111
            1112212111111233323323342443333332211
  111122211112223333333240388333333221111122211111
           1 2 2 2 3 3 3 3 1 1 2 9 0 8 8 8 7 1 1 1 3 3 3 3 2 2 1 1
  1111111
                                    111111111
           1122333311222222111133322211
   11111
                                        1 1 1 1 1
           1112221222222222122221111
            111112222222222222211111
             11112221222221222111111
             11111221121211122111111
               1111111112221121111111
                111111111111111111
                   1 1 1 1 1 1 1 1 1
(0,0)
```

CROSS SECTION 47
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

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---Bunnamanacoundada--
H-mananananananananan---
TTTTころころことかのををををををすて
-
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CROSS SECTION 48
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

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HOUR ASSESSMENT
CROSS SECTION AVERAGE DOCTORS EVALUATION 1
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- NANDANANA CONTRADANANA
-NAMANAMANCOOJNAMANAHAN-
としろうろうろうきりゅううこここととこととしまる
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```

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1 1 1 1 1 1 1 1 1
                        1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
                       1 1 1 2 2 2 2 3 3 2 2 2 2 2 2 1 1
                     1 1 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 2 1
                    3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 1
                  2 1 2 2 1
                        1 1 1 2 2 1 2 1
                                                 12122111
                1111111111
                   2 3 3 3 3 4 4 4 4 4 8 7 4 4 3 3 3 4 4 3 3 3 3 3 2 1 2 2 2 2 1 1 1 1 1
   1 1 1 1 1 2 2 2 2 1
                   1 1 1 1 2 2 2 2 1
                   2 3 3 3 3 3 3 3 3 6 7 8 8 3 3 3 3 4 4 3 3 3 3 2 1 1 1 1 1 2 2 1 1 1
   1 1 1 2 2 1 1 1 1
                   3 3 3 3 3 3 3 3 3 4 0 0 8 6 3 2 3 3 3 3 3 3 3 3 2 1
                                                   11111111
   1 1 1 1 1 1 1 1
                   3 3 3 3 3 2 3 3 3 3 0 0 3 2 2 5 5 3 3 3 3 3 3 3 2 1
    1 1 1 1 1 1
                                                     111111
               1 1 2 3 3 3 3 3 5 4 2 2 2 2 2 2 2 2 4 5 4 4 3 3 3 3 3 2 1
                12223354332232222344443333224
                1 1 2 2 3 3 4 4 3 3 1 2 2 2 2 2 1 3 3 3 3 3 3 3 3 2 1 1
                11111111122222111111111
                    1111111111111111111111111
                     1111111111111111111
(0,0)
                          CRUSS SECTION
                                     51
                  AVERAGE DOCTURS EVALUATION 1 HOUR ASSESSMENT
```

```
1 1 1 1 1 1
                             1 1 2 2 3 3 3 3 3 3
                                       3 3 3 3
                          1 1 2 3 3
                                 3 3 3 3
      1111111
                                                                 1111111
         1 1 1 1
                            21111112211111
                        1111111111111111111111111
(0,0)
```

CROSS SECTION 52
AVERAGE DOCTURS EVALUATION 1 HOUR ASSESSMENT

```
1 1 1 1 1 2 2 1 1 1 1 1 1 1 1
                            1 1 2 2 3 3 3 3 3 3 3 3 3 2 2 2 1 1
                                       3 3 3 3 3 3 3 3 2 2 1 1 1
      1 1 1 1
    1 1 1 1 1 1 1
                                       3 3 3 4
                                                                  111111
    1111133
                                                                  3 3 1 1 1 1 1
    11111331
                                                           331113311
       1 2 2 2 1 1 1
       1222111
    1 1 1 1 1 1 1 1 1
      1 1 1 1 1 1 1 1
         1 1 1 1 1
                         1 1 2 2 3 3 3 3 3 3 3 2 2 2 3 2 2 2 3 3 3 3 3 3 3 3 3 3 2 1
                      1 1 2 2 2 3 3 2 2 2 1 2 3 2 1 2 2 2 2 3 3 3 2 2 1 1
                      11122212221222122222222211
                        111111111112211111112211
                         11111111111111111111111111
                                          1 1 1 1 1 1
(0,0)
                                 CROSS SECTION
                                              53
```

AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

(0,0)

1 1 1 1

1 1 1 1 1 1 1 1 3 3

1 1 1 1 1 1 1 1

3 3 2 1

CROSS SECTION 54
AVERAGE DOCTURS EVALUATION 1 HOUR ASSESSMENT

**+**Y

```
1 1 1 1 1 1 1 1 1 1 1 1 1
             3
                                                 1 1 1
1 1 1 1 1 1
             3
                 3
                         3
                                                111111
                                               111111
                             5
             3
                         3 5 6
                              3
                                              1 3 3 4 1 1 1 1
   1431133
                3 3
                       3
                                             1113411111
11111111354
                                               1111111
 1111111243334
                                              1111111
  111112
          4 5 3 3 3 3 4
                        0 C
                          3 5 3 5 4
                                               11111
          3 3 3 3 3 3 5 3 2 3 4 2 2 2 5 3 3 5
          4455543114422245433
        112454122345223225343333542111
         111134544211122113455541
         11111221111112111111221111
            11111111111111111111111111
                     CROSS SECTION
```

AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

```
CROSS SECTION 50
AVERAGE ODCIORS EVALUATION 1 HOUR ASSESSMENT
```

```
THE REPORT OF THE PART OF THE
             しょう ちららり りゅう ちらう こうしょ
        よろうり うううてう うりうり うりゅうきょ
    ~ m o n n n n n n n n n o n ~
よよるちょうちゅうてうらうちょうう うちゅう
しょうごうろうりゅうりうううううらう ううんごう
THE MATOR MOOT OF OFFICE ACTION TO THE MATOR OFFICE ACTION TO THE ACTION 
ままご かり ゆり ゆり と ち ち ら り り り り と と ま ま
4 N 4 O 6 C O 6 O 6 O 6 O 7 O 7 N N N N N N N N N N N N N N
よろきらりらりりゅう りょうこうこうこう ちゅうきょしょ
ままるらうらららみみみららうぎらりひょす
          11500755555500582~
                  しましょ ようち ららら みゅうこころまま
                           しまななななななななられるし
```

```
CROSS SECTION 57
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT
```

```
HNN-44MM6-49COOOCOOON
1144000000000000000mm2000
HANDOOOOOOOOONNOOOONNH
ままなみらららてららららららかみみごまま
```

```
CROSS SECTION 58
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT
```

```
____
     よまひまままらよ
     HHM4BHHHHH
      -----
   としょくころ ちょうきょう
  よよしろう ゆうら ゆうこうこう こうこう
  しょぶころ ひかうろうらり ゆゆきこここま
 よよしこう ゆうろううううう ゆうきんしょ
しし こうて ううらうううう うちゅ アラう ゆきまし
よしこらうろうろうて でっとりらう うらゅうよ
ままるぎァアのののののののののちろうちゅぎまま
44NF00000000NFMF00000
HHNROCOCCCCCCCRMMARNAHH
ままなららいらりりょうららるきままま
111140000000FF0055554
44447700007770000044400M
ようしこみらうちららりてて ろうろう ひらろう
としょこう かうらうらて 子うらうらう ゆゆくこう
11122965575555852221
 ままころろうららり ちゅうりゅうころこと
  111111 ころこ 4 ごるごろご 2立 11
   ようふきょうきょう ここここここうしょ
       ----
```

```
CROSS SECTION 59
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT
```

```
------
4444000000000000044
よまとらり らりりりりりゅう うまきてて ころま
44666666666666666664664
```

```
----
     ----
     -----
    て しょって て て て ま T
    ようこうごうこう
    とまらてことこうとまま
    ままここここここここ
   ままさまえてて ちくさまちまま
   ままごこごごご ととうままま
  まままる ちょうまる なっちょうきょう
 ままこなら 11113g まちろ ままま
 しょうころうちゃ キュころころうしょ
よまますらゆう ろろろう ちゅう さんごうま
 ままる ゆうち ろうち うろう すず らままま
 よしこ ひろうろうろ アララマア ウスまよる
1112かろちろうらららうずるゆるまま
として ちららり ちゅうちょう ちょうき
まままでかから云なりのとなりのもとままま
よしまできてのこのの下の下をみみをままり
ますまさらしいいいのでもとするとままで
ままする としょりの ひりりて するまま
 ままここちゅうりゅうちゅう ゆうよまま
 まえことらうちゅすす ゆうゅうゅうようほ
 よよでななできららりらびらなるなるまま
 11210 今 ろ ろ ろ ろ ち ち う り る き き ま
 しょよろろう ちょうきょう ゆゆき らょうしょ
 心上してしむ ララグララア ゆみ ここぞこま
 ままえてく かかか ゆゆき 見ごろことまま
 ままころころうこうまうこころこここまま
  すれどとととできますこととととととも
   よまえますすり きろえき こうてきり
   まままちょうち ちきこうこうこう
    ままこと ちょうきき ちごまま
     まこここここここここまままま
     生してここここととしま
      まよこことまままぼまま
      ままちてちょよまま
```

```
CROSS SECTION 61
AVERAGE ODCTORS EVALUATION 1 HOUR ASSESSMENT
```

```
上手上のするさらさらららりと上まる
4444000000000000000
とえるちゅうててらきぬ てきるこまし
しょ ここの アイ り ろ ろ り ら き ひ し し し
112200000000000011111
ユエンスト B ゆ ら 5 5 5 5 5 7 5 1 1 1 1 1
こしこと ちゅうりょくしょうしょ
しょことををわわりとのわしにて
```

よままごろまままん **1555555m**11 13~ ころろろうろうきょ しままでできることです まして ころこここここ こしょ まる ち ころ さ こ こ ら と 1 1 **まますことこことをまま** まますでごさらこと とままま まままる こうきままる ころうきまま まままろ こままえらここと よままま しょうことところことととしまま、 まして ちょうこうこう ちょうま まますを さらら ここう ちょまま まままて ちろう きをき ろうとこうままま まままてで ロウム 4 0 名 こここままま よして マママ ウ ら く り と く と し 上 上 ままての88604年ごごここまます としきり ちゅうちょう ちゅうこうしょう しょこうりうごう チャラ ここてままま まますででできてきららくのなままま **44100800040000000** しょしきころののののちこことしょし ままとできることととをとりましま 111222222222111 ようようこここここと まましょうこうしょ **ままとことをまままころとをまま しょこことこととここことに** ままるろうりょうこころ なぎぎ しょうこうこうこうしょ **ままるさるさることもまま** 1000000001111 **していることのこしょ よろころころこう まてまてごこことまま** 

----

CROSS SECTION 62 AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

```
しゅうろこみごろここと しょ
ようなのろうららなってまます。
```

، اب اب

**ニュラトト 4 2 2 2** 

しょうこうちゅう ちょうこうしょうこうこう ちょうこうちゃく ちょうこうこう

**よるよるでするものもるとまる。** 

**112240m ラこここ**す

\_\_\_\_

10.01

CROSS SECTION 71
AVERAGE DOCTURS EVALUATION 1 HOUR ASSESSMENT

218

**+**Y

CROSS SECTION 73
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

```
1 1 1 1

1 1 1 1 1 1

1 2 3 3 2 2 1 2 2 2 2 2 1 1

1 2 3 3 3 2 2 1 2 2 2 2 2 2 1

1 2 2 3 3 3 3 2 1 2 2 2 2 2 2 1

1 2 1 2 2 3 2 1 2 2 2 2 3 2 2 2 2 1

1 2 3 4 4 4 0 0 0 4 4 4 4 4 3 2 1

1 2 3 4 4 4 9 0 5 0 4 4 4 4 4 2 1

1 2 3 4 4 4 9 0 5 0 8 4 4 4 3 2 1

1 2 4 4 4 5 7 8 5 8 4 4 4 3 2 1

1 2 4 4 4 6 6 8 6 8 5 4 4 7 2 1

1 2 4 4 4 5 5 7 7 7 5 4 4 7 2 1

1 3 8 4 4 5 6 6 6 5 5 4 8 3 2 1

1 3 8 4 4 5 6 6 6 5 5 5 8 2 1

1 3 8 4 4 4 5 9 8 8 8 3 1

1 3 4 4 4 4 3 2 2 1 1

1 1 1 2 1 1 1
```

CROSS SECTION 74
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

```
1 1 1

1 1 2 2 2 1

1 3 3 2 2 2 2 2 2 3 3 2

1 2 3 3 3 4 4 4 3 2 3 3 3 2 1

1 1 2 2 2 3 4 4 3 3 3 3 3 3 2 2 1

1 2 3 3 3 4 4 4 4 3 3 3 3 3 3 2 1

1 2 4 5 4 4 4 4 4 4 4 4 4 4 4 2 1 1

1 2 3 4 6 6 5 5 5 5 6 4 4 4 4 4 4 2 1

1 2 4 4 4 6 6 9 9 9 9 4 5 4 4 4 4 4 4 1

1 1 3 4 4 5 5 6 7 8 8 8 6 4 4 4 4 4 4 1 1

1 1 3 4 4 4 5 5 5 6 6 5 6 6 6 4 4 4 4 4 1 1

1 1 3 4 4 4 5 5 6 6 6 6 6 4 4 4 4 4 1 1

1 3 4 4 4 5 5 6 6 6 6 6 4 4 4 4 4 1 1

1 3 4 4 4 5 5 6 6 6 6 6 4 4 4 4 4 1 1

1 3 4 4 4 4 5 5 6 6 6 5 4 4 5 3 1

1 3 4 4 4 4 6 5 6 6 5 4 3 3 1

1 3 4 4 4 6 6 5 4 3 3 1

1 1 2 2 2 2 2 2 2 1

1 1 1 1 1 1
```

CROSS SECTION 75
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

10,01

CROSS SECTION 76
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 77
AVERAGE DOCTURS EVALUATION 1 HOUR ASSESSMENT

```
1 1 1 1 2 1 1

1 2 3 4 4 7 4 4 4 2

1 3 4 4 4 4 5 4 4 4 4 4 4 4 1

1 3 4 4 4 4 5 4 4 4 4 4 4 3 1

1 4 4 4 4 4 4 5 5 5 5 5 5 5 4 4 4 2

1 2 4 4 4 4 4 4 6 5 5 5 5 5 5 5 5 5 5 5 1

1 2 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 5 3 1

1 2 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 3 1

2 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 3 1

2 4 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 3 1

1 2 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 3 1

1 2 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 3 1

1 2 4 4 4 4 4 4 5 5 5 5 5 5 5 5 5 5 3 1

1 3 4 4 4 4 5 4 4 4 4 4 4 2

1 3 4 4 4 4 5 4 4 4 4 4 4 4 1

1 3 4 4 4 4 5 4 4 4 4 4 4 4 1

1 1 3 4 4 4 6 6 4 4 4 4 4 4 1

1 1 3 4 4 4 6 6 4 4 4 4 4 1

1 1 3 4 4 4 6 6 4 4 4 4 4 1

1 1 1 1 1 1 1 1
```

CROSS SECTION 78
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

(0.0)

```
1 2 1 1 2 1

1 2 3 4 7 4 4 3 2 1

1 2 4 4 4 6 4 4 4 4 4 4 3 1

1 3 4 4 4 5 4 4 4 4 4 4 4 1

2 3 4 4 4 4 5 4 4 4 4 4 4 4 1

1 2 4 4 4 4 5 6 4 4 4 4 4 4 5 1

1 3 6 4 4 4 4 5 6 4 4 4 4 4 4 5 1

1 3 5 4 4 4 4 5 5 5 5 4 4 4 4 4 4 3 1

1 3 4 4 4 4 5 5 5 5 4 4 4 4 4 4 3 1

1 2 5 4 4 4 4 6 6 4 4 4 4 4 4 3 1

1 2 3 4 4 4 6 5 5 6 4 4 4 4 4 3 1

1 2 3 4 4 4 6 5 5 6 4 4 4 4 4 3 1

1 2 3 4 4 4 6 5 5 6 4 4 4 4 4 3 1

1 2 3 4 4 4 6 5 5 6 4 4 4 4 4 3 1

1 2 3 3 3 7 4 4 4 4 3 1

1 1 2 2 2 2 2 2 2 2 3 1 1

1 1 1 1 1 1 1 1
```

CROSS SECTION 79
AVERAGE DOCTURS EVALUATION 1 HOUR ASSESSMENT

226

CROSS SECTION 31
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

CROSS SECTION 82 AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

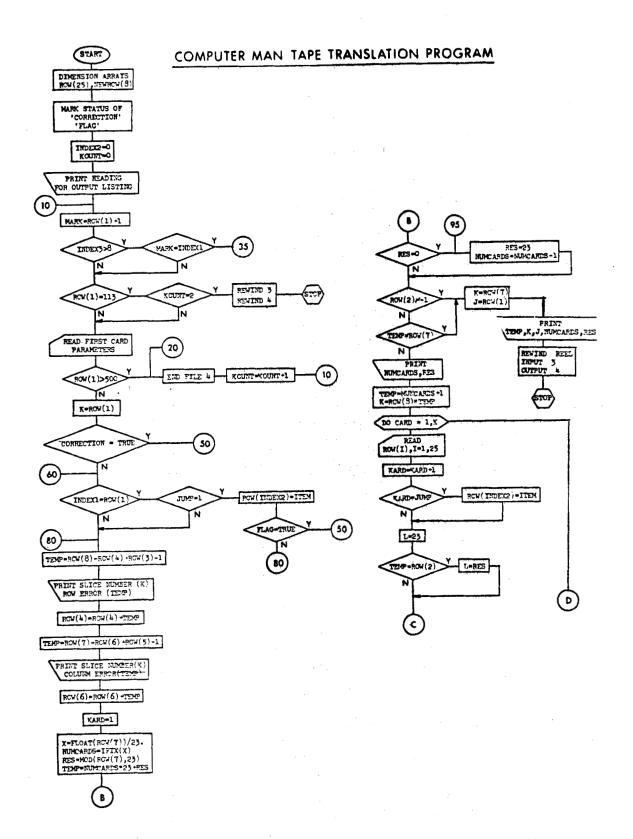
CROSS SECTION 83 (DUMMY REGION)

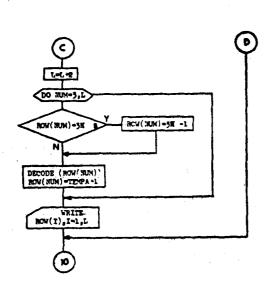
AVERAGE DOCTORS EVALUATION 1 HOUR ASSESSMENT

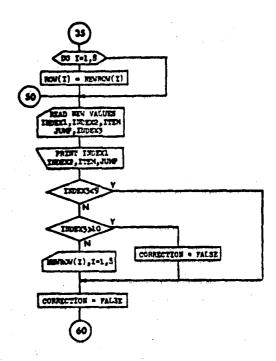
230

## APPENDIX D

FLOW CHARTS AND PROGRAM LISTINGS ASSOCIATED WITH THE COMPUTER PROGRAMS CONTAINED IN THIS REPORT

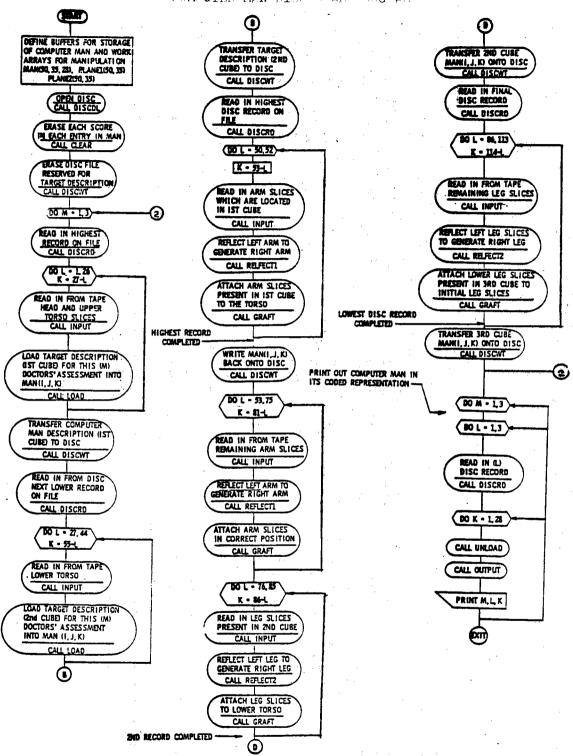


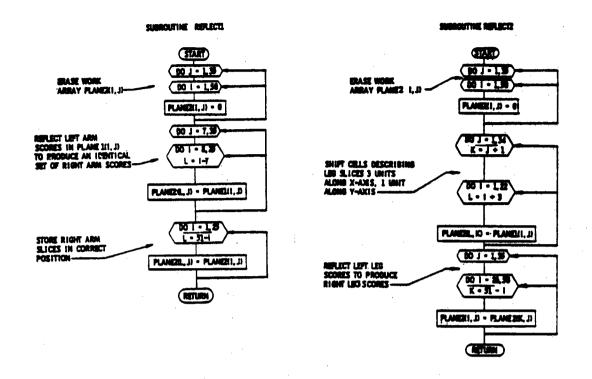


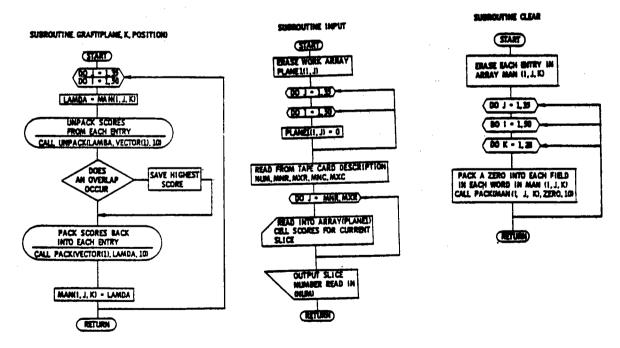


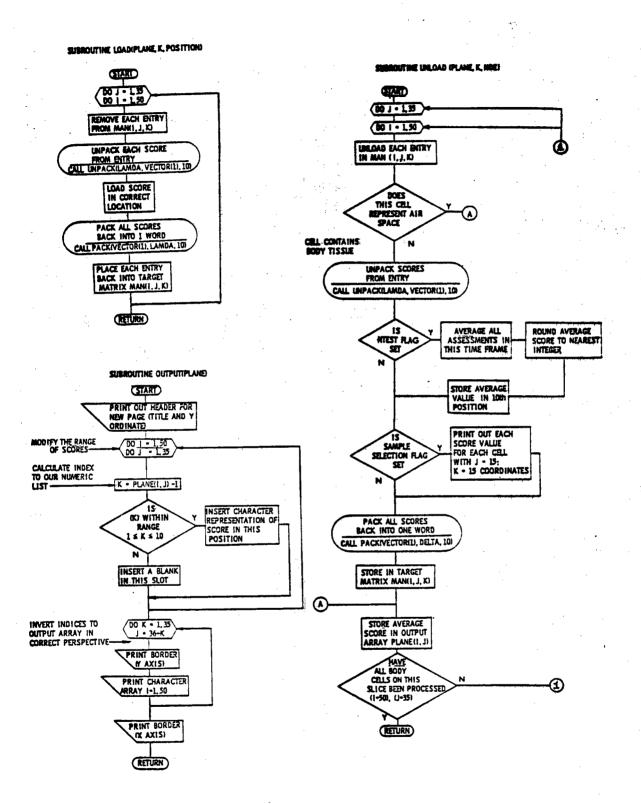
```
LIST(START)
      COMM REEL 24A11 TO UNIT 3 INPUT
      COMM REEL 26C14 TO UNIT 4 OUTPUT
      MAXO(15000)LINES
      MAXT(10)MINS
      DIMENSION ROW (25), NEWROW (8)
      INTEGER KOW, TEMP, CARD, RES, TEMPA
      LOGICAL CORRECTION, FLAG
C
       CORRECTION - THERE ARE CORRECTIONS TO BE MADE
C
       FLAG - APPLY CORRECTION TO THIS LINE
C
       MARK FLAG WHERE SLICE IS TO BE CORRECTED
C
C
      CORRECTION=.TRUE.
      FLAG . TRUE
      INDEX2=0
      KOUNT=0
      WRITE(6,111)
      FORMAT( FOROW AND COLUMN COUNTS ARE A CHECK ON THE PARAMETERS).
111
              ' THAT POSITION THE SUBMATRIX WITHIN THE SLICE. ! .
              /, OTHIS PROGRAM EDITS THE FIRST CAND S PARAMETER. 1)
10
      MARK=ROW(1)+1
C
       INDEX3 KEY
C
           CHANGE CARD ENTRY
C
           READ IN NEW HEAD CARD
C
        10 APPLY NO MORE CORRECTIONS
C
C
      IF (INDEX3.GT.8.AND.MARK.EG.INDEX1)GO TO 35
      IF(ROW(1).EQ.113.AND.KOUNT.EQ.2) GO TO 30
      READ(3,108)(ROW(I), I=1,8)
      FORMAT(13,12,414,4X,214)
108
      IF(ROW(1),GT.500) GO TO 20
      K#ROW(1)
      IF (CORRECTION) GOTO 50
60
      IF (INDEX1.EQ.ROW(1) .AND. JUMP.EU.1) GOTO 70
80
      TEMP=RDW(8)=RDW(4)+ROW(3)=1
      WRITE(6,103)K, TEMP
103
      FORMAT( USLICE', 2X, 15, 2X, 'ROW COUNT OFF BY', 2X, 15)
      ROW(&) = RUW(4) + TEMP
      TEMP=ROW(7)=ROW(6)+ROW(5)=1
      WRITE(6,104)K, TEMP
104
      FORMAT('OSLICE',2X,15,2X,'COLUMN COUNT OFF 8Y',2X,15)
      ROW(6)=ROW(6)+TEMP
      KARD=1
      *RITE(4,100)(RDW(1),1=1,8)
      FURMAT(13,12,414,4X,214)
100
      X=FLOAT(ROW(7))/23.
      NUMCARDS=IFIX(X)
      RES=HOD(ROW(7),23)
      TEMP = NUMCAKDS + 23+RES
      IF (RES.EQ.0)GO TO 95
      1F(ROW(2).NE.-1)GO TO 40
90
      IF (TEMP : NE . ROW (7)) GOTO 40
      WRITE(6,105)NUMCARDS, RES
105
      FORMAT(!UNUMBER OF EVEN CARDS PER COLUMN!,2X,15,2X,!WITH!,
              2x, 15, 2x, 'LEFT OVER')
```

```
TEMP=NUMCARDS+1
      K=ROW(8) + TEMP
      UO 1000 CARD=1,K
         READ(3,101)(ROW(1),1=1,25)
      KARD=KARD+1
      IF (KARD .EQ. JUMP) ROW (INDEX2) - ITEM
101
         FORMAT(13,12,23A3)
         L=23
         IF (TEMP.EU.ROW(2))L=RES
         L=L+2
         DO 2000 NUM=3,L
             IF(ROW(NUM).EQ.3H B)ROW(NUM)=3H -1
             DECOBE(10,107, ROW(NUM)) TEMPA
107
             FORMAT(13)
             ROW(NUM)=TEMPA+1
2000
         CONTINUE
         WRITE(4,106)(RDW(I), I=1,L)
106
         FORMAT(13,12,2313)
      CONTINUE
1000
      GOTO 10
      END FILE 4
20
      KBUNT=KOUNT+1
      GOTO 10
30
      REWIND 3
      REWIND 4
      STOP
      K=ROW(7)
40
      J=ROW(1)
      WRITE(6,102)TEMP,K,J,NUMCARDS,RES
      FORMAT( OITEM: +++ERROR+++ CARD CHECK , /,
102
              10x, COMPUTED NUMBER OF ENTRIES', 15,/,
              10x, 'INPUT NUMBER OF ENTRIES', 15, 2X,
     3
              'ON SLICE', 15, /, 10X,
              'COMPUTED NUMBER OF CARDS', 15,2X,
              'WITH', I5, 2X, 'LEFTOVER')
      REWIND 3
      REWIND 4
      STOP
C
        LOOP 3000 INSERTS A NEW ROW
C
C
35
      DO 3000 I=1,8
         ROW(I)=NEWROW(I)
3000
      CONTINUE
50
      READ(5,109) INDEX1, INDEX2, ITEM, JUMP, INDEX3
109
      FORMAT(515)
      WRITE(6,110) INDEX1, INDEX2, ITEM, JUMP
      FORMAT('OCORRECTION ENTERED FOR SLICE', 15, 2x,
110
              'THE', 15, 2X, 'TH NUMBER SUBSTITUTED BY', 15,
             2x, ION THE', 15, 1x, 'TH CARD OF THE SLICE')
      IF(INDEX3 .LT. 9) GOTO 25
      1F(INDEX3 .GT. 10) GOTO 45
      READ(5,108)(NEWROW(I),1=1,8)
      CORRECTION= . FALSE .
25
      GOTO 60
      FLAG=.FALSE.
45
      GO TO 25
      RDW(INDEX2)=ITEM
70
      IF(FLAG)GO TO 50
      GOTO 80
      KES=23
95
      NUMCARDS=NUMCARDS=1
      GO TO 90
      END
                                235
```









```
X4723 328 COMPUTER MAN DISC LOAD
+VL779A
          STANLEY
      LIST(START)
      COMM DISC 55023 TO UNIT 3
$
      COMM REEL 26014 TO SWITCH 4 , INPUT
3
      MAXT(35)MINS
$
      MAXO(20000) LINES
      DIMENSION NAME (4)
      COMMON/MAN/MAN(50,35,28)
      COMMON/ PLANE1/PLANE1(50,35)
      COMMON/PLANE2/PLANE2(50,35)
      INTEGER PLANE1, PLANE2
      DATA IDD, IDF/10H55D23 BODY, 10HINFIN COMP/
      CALL DISCOL (3, NAME, IDD)
      CALL DISCOF(IDF, 49000, 400, IDUMMY, 0)
      CALL CLEAR
      DO 6000 K=1,3
          CALL DISCHT(IDF, K, 1, MAN)
6000
      CONTINUE
      DO 1000 M=1,5
      CALL DISCRD(IDF, 3, 1, MAN)
      UO 2000 L=1,26
          Km27-L
          CALL INPUT
          CALL LOAD (PLANEI, K, M)
1120
          FORMAT(11X, 15, 10X, 15)
      CONTINUE
2000
      CALL DISCHT(IDF, 3, 1, MAN)
      CALL DISCRD(IDF, 2, 1, MAN)
      DO 3000 L=27,44
          K=55-L
          CALL INPUT
          CALL LOAD (PLANEI, K, M)
      CONTINUE
3000
      CALL DISCHT(IDF, 2, 1, MAN)
      CALL DISCRD(IDF, 3, 1, MAN)
      90 7000 L=50,52
          K=53-L
          CALL INPUT
          CALL REFLECTS
          CALL GRAFT(PLANE2,K,M)
7000
      CONTINUE
      CALL DISCHT(IDF, 3, 1, MAN)
      CALL DISCRD(IDF, 2, 1, MAN)
      DO 8000 L=53,75
          K=81-L
          CALL INPUT
          CALL REFLECTS
          CALL GRAFT (PLANE2, K, M)
8000
      CONTINUE
      UO 9000 L=76,85
      K=86-L
          CALL INPUT
          CALL REFLECT2
          CALL GRAFT (PLANE2, K, M)
9000
      CONTINUE
      CALL DISCHT(IDF, 2, 1, MAN)
      CALL DISCRUCIOF, 1, 1, MAN)
      DO 1010 L=86,113
```

OCT.30,76 BRLESC2 FORTRAN.

```
K=114-L
         CALL INPUT
         CALL REFLECT2
         CALL GRAFT (PLANE2, K, M)
      CONTINUE
1010
      CALL DISCHT(IDF, 1, 1, MAN)
1000
      CONTINUE
      UO 4000 M=1,5
          DO 4000 L=1,3
             CALL DISCRU(IDF, L, 1, MAN)
             DO 4000 K#1,28
                CALL UNLOAD (PLANEI, K, M)
                CALL OUTPUT(PLANEI)
                WRITE(6,100)M,L,K
                FORMAT ('OUOCTUR INTERPRETATION', 15,2X,
100
                    'DISC RECORD', 15, 2X, 'SLICE', 15, 2X)
4000
      CONTINUE
         REWIND 4
      STOP
      END
```

```
LIST(START)
C
C
      SUBROUTINE CLEAR
      DIMENSION ZERO(10)
      COMMON/MAN/MAN(50,35,28)
      INTEGER ZERO
      DATA ZERO/10+0/
      UO 1000 J=1,35
         00 1000 1=1,50
             DO 1000 K=1,28
             CALL PACK(MAN(I, J, K), ZERO, 10)
1000
      CONTINUE
      RETURN
      END
```

```
C
 C
       SUBROUTINE REFLECTS
       COMMON/PLANE2/PLANE2(50,35)
       COMMON/ PLANE1/PLANE1(50,35)
       INTEGER PLANE1, PLANE2
       DO 1000 J=1,35
          DO 1000 I=1,50
             PLANE2(1, J)=0
 1000
       CONTINUE
       DO 2000 J=7,35
             DO 3000 1=8,25
                L=1-7
                 PLANE2(L,J)=PLANE1(1,J)
3000
             CONTINUE
             DO 4000 1=1,25
                L=51-1
                PLANE2(L,J)=PLANE2(1,J)
4000
             CONTINUE
2000
       CONTINUE
       KETURN
       ENU
      LIST(START)
C
C
C
      SUBROUTINE REFLECT2
      COMMON/PLANE2/PLANE2(50,35)
      COMMON/ PLANEI/PLANEI(50,35)
      INTEGER PLANE1, PLANE2
      UO 1000 J=1,35
         DO 1000 1=1,50
            PLANEZ(1,J)=0
1000
      CONTINUE
      DO 2000 J=1.34
         K=J+1
         DO 2000 I=1,22
            L=1+3
            PLANE2(L,K)=PLANE1(I,J)
```

LIST(START)

PLANE2(I,J)=PLANE2(K,J)

2000

3000

CONTINUE

CONTINUE RETURN ENU

UO 3000 J=1,35

DO 3000 I=26,50 K=51-I

```
LIST(START)
C
Č
      SUBROUTINE GRAFT (PLANE, K, POSITION)
      INTEBER PLANE, POSITION, VECTOR
      BIMENSION PLANE (50,35)
      DIMENSION VECTOR(10)
      COMMON/MAN/MAN(50, 35, 28)
      DO 1000 J=1,35
          DO 1000 1=1,50
             LAMBA=MAN(I,J,KY
               CALL UNPACK(LAHDA, VECTOR(1),10)
             IF (VECTOR (POSITION) . LT. PLANE (I, J))
                     VECTOR (POSITION) =PLANE(1,J)
             CALL PACK (VECTOR(1), LAMDA, 10)
             MAN(I,J,K)=LAMDA
1000
      CONTINUE
      KETURN
      END
```

```
LIST(START)
C
C
      SUBROUTINE LOAD (PLANE, K, POSITION)
       DIMENSION PLANE (50,35)
       INTEGER PLANE, POSITION, VECTOR
       DIMENSION VECTOR(10)
       COMMON/MAN/MAN(50,35,28)
       BO 1000 J=1,35
          DO 1000 1=1,50
             LAMDA=HAN(I,J,K)
             CALL UNPACK (LAMDA, VECTOR (1), 10)
             VECTOR (POSITION) = PLANE (1, J)
             CALL PACK(VECTOR(1), LAMBA, 10)
             MAN(I,J,K)=LAMDA
       CONTINUE
1000
       RETURN
       END .
```

```
DIMENSION PLANE2(50,35)
                 DIMENSION NUM(10)
                 DIMENSION HORDER (100)
                 INTEGER BORDER
                 INTEGER PLANE
                 INTEGER PLANES
                 INTEGER CHAR
                 INTEGER BLANK
                 DATA BORDER/100+1H./
                 DATA CHAR/! .!/
                 DATA NUM/1 11,1 21,1 31,1 41,1 51,1 61,
                11 71,1 81,1 91,1 01/
                 UATA BLANK/!
                 WHITE(6,101)
                 FORMAT('INEW PLANE', /, 1 11, /, 1 +Y')
          101
                 NO 5000 1=1.50
                 UO 2000 J=1,35
                 K=PLANE(1,J)-1
                 IF(K.GE.1.AND.K.LE.10) GO TO 105
                 PLANEZ(I,J)=BLANK
                 90 TO 2000
          105
                 PLANE2(1,J) = NUM(K)
          2000
                 CONTINUE
                 UO 1000 K=1,35
                    J=36-K
                 WRITE(6,100) CHAR, (PLANEZ(1,J), 141,50)
          100
                 FORMATICX, 1A2, 50A2)
          1000
                 CONTINUE
                 WRITE(6,103)(BORDEN(1),1=1,50)
           103
                 FORMAT(4X,50A2)
                 WRITE(6,102)
                 FORMAT( (0.0) , 95%, +X ->1)
           102
                 HETURN
                 END
C
      SUBROUTINE INPUT
C
       THIS SUBROUTINE READS THE CARD DESCRIPTION OF THE ARRAY MAN AND PLACES
C
      INTO ACTIVE MEMORY IN PLANE FOR MANIPULATION AND ASSIGNMENT INTO MAN
      COMMON/ PLANE1/PLANE1(50,35)
      INTEGER PLANEL
      UO 1000 J=1,35
         DO 1000 I=1,50
            PLANE1(I,J)=0
      CONTINUE
1000
         READ(4,100)NUM, MNR, MXR, MNC, MXC
         FORMAT(13,2X,414)
100
         DO 2000 J=MNR, MXR
            READ(4,101)(PLANE1(I,J),I=MNC,MXC)
101
            FORMAT(5X, 2313)
2000
      CONTINUE
      WRITE(6,103)NUM
FORMAT('UPLANE',13,2x,' READ IN')
103
      RETURN
      END
                                     243
```

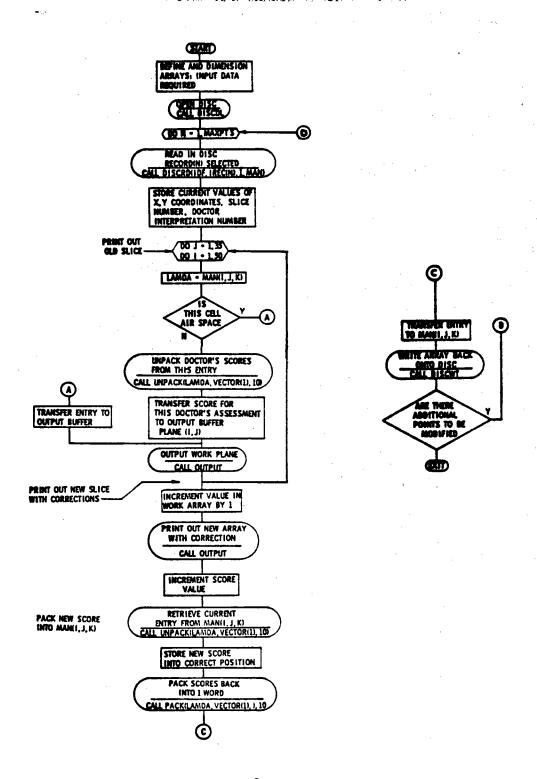
LIST(START)

BUBROUTINE OUTPUT(PLANE)
DIMENSION PLANE(50,35)

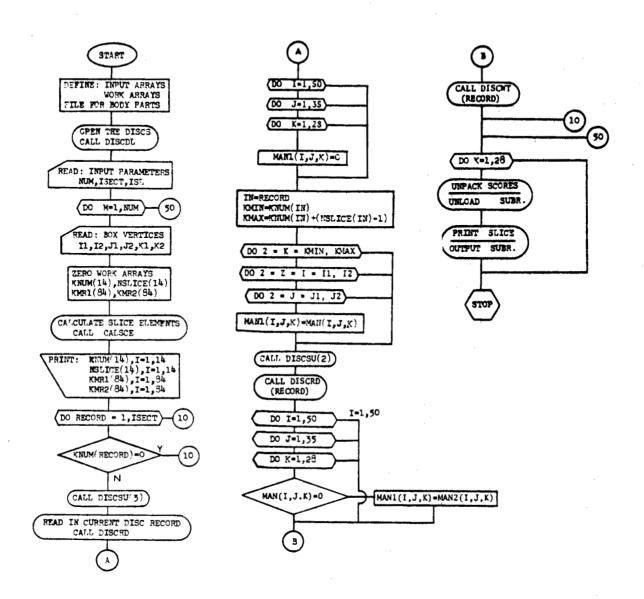
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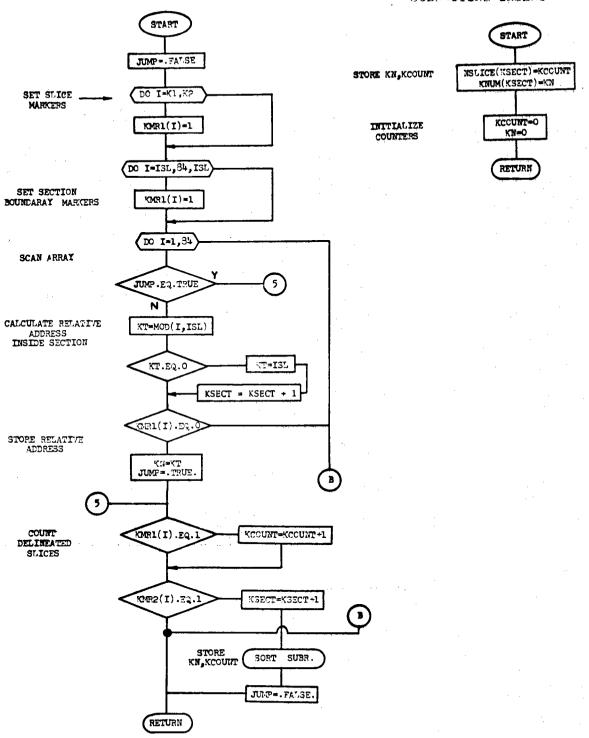
```
LIST(START)
C
Č
C
      SUBROUTINE UNLOAD (PLANE, K, NDE)
      INTEGER PLANE, POSITION, VECTOR
      INTEGER DELTA
      DIMENSION PLANE (50,35)
      DIMENSION VECTOR(10)
      COMMON/MAN/MAN(50,35,28)
      COMMON KCHECK
      UO 1000 J=1,35
          Do 1000 1=1,50
             LAMDA=MAN(I,J,K)
C
      IS THIS CELL AIR SPACE
      OR IS IT PART OF THE MAN
C
      IF(LAMDA.ER.O) GO TO 1060
             CALL UNPACK(LAMDA, VECTOR(1), 10)
      KNUE=NDE
      IF (KCHECK.EG.1) KNDE=NDE-1
      AVERAGE CELL VALUES
C
C
      ROUND
               CELL
                    VALUES TO
                                 NEAREST
      ITOTAL=0
      UO 1010 L=1,KNUE
      ITUTAL=ITOTAL+VECTOR(L)
1010
      CONTINUE
      ATUTAL=FLOAT(ITOTAL)
      SNUE=FLOAT (KNDE)
      AVG1=ATOTAL/SNDE
      LAMDA=IFIX(AVG1)
      BETA = FLOAT (LAMDA)
      RESMAVGI-BETA
      IF(RES.GT.O.49) LAMDA=LAMDA+1
C
      PROGRAM AVERAGES SCORES AND PACKS AN AVERAGE SCORE INTO
      EACH WORD IN 10TH POSITION
C
      VECTOR(10)=LAMDA
      IF(K-15)1020,1030,1020
1030.
      IF(J=15)1020,1040,1020
      WRITE(6,1050)(VECTOR(N),N=1,10),ITOTAL,ATOTAL,SNDE,AVG1,LAMDA,
1040
     1BETA, RES
      FORMAT(5X, 1013, 3X, 14, 3X, 3F5, 2, 3X, 13, 3X, F5, 2, 3X, F5, 2)
1050
      PACK ALL SCORES BACK INTO ONE HORD
C
1020
      CALL PACK(VECTOR(1), DELTA, 10)
      MAN(1,J,K)=DELTA
1060
      PLANE(I,J)=LAMDA
1000
      CONTINUE
      RETURN
      END
      LIST
```

BATA



```
LIST(START)
      COMM DISC 50021 TO UNIT 3
$
      MAXT(25)MINS
      MAX0(15000)LINES
      CIMENSION VECTOR(10)
      CIMENSION NAME(4), ISLICE(10), IX(10), IY(10), NEWVAL(10), IREC(10),
     1COCINT(10)
      COMMON/MAN/MAN(50,35,28)
      COMMON/ PLANE1/PLANE1(50,35)
      COMMON/PLANE2/PLANE2(50,35)
      CIMENSION PLANE(50,35)
      INTEGER PLANE, DOCINT
      INTEGER PLANE1, PLANE2
      INTEGER VECTOR
      CATA MAXPTS/3/
      CATA COCINT/3,2,2,7*0/
      CATA IREC/3,3,3,7*0/
      CATA ISLICE/2,1,1,7*0/
      DATA NEWVAL/9,1,1,7*0/
      CATA IX/27,13,40,7*0/
      CATA 1Y/17,15,15,7*0/
      CATA IDC, IDF/10H5CD21 BODY, 10HBQDY
C
         NUMBER OF POINTS TO BE CHANGED
         INPUT X,Y,Z COORDINATES ,SLICE*, NEW VALUE
C
С
      COCTOR INTERPRETATION NUMBER
         CALL DISCOL(3, NAME, IDD)
      DO 100 N=1.MAXPTS
      UTILIZING DATA INPUT READ IN CORRECT DISC RECORD
C
      CALL DISCRO (IDF, IREC(N), 1, MAN)
         STORE SLICE NUMBER X,Y,CCORDINATES
C
      II = IX(N)
      IJ=IY(N)
      K=ISLICE(N)
      L=COCINT(N)
         RETRIEVE CORRECT ENTRY FROM MAN(I, J, K)
C
      CO 1000 J=1,35
      CO 1000 I=1,50
      LAMDA=MAN(I,J,K)
      IF(LAMDA.EQ.O) GO TO 1020
      CALL UNPACK (LAMDA, VECTOR (1), 10)
      PLANE(I.J)=VECTOR(L)
      GO TO 1000
1020
      PLANE(I,J)=LAMDA
1000
      CONTINUE
      PRINT OUT OLD ARRAY
C
      CALL OUTPUT(PLANE)
C
      PRINT OUT NEW ARRAY WITH CORRECTIONS
      PLANE(II, IJ)=NEWVAL(N)+1
      CALL OUTPUT(PLANE)
C
      INCREMENT VALUE, STORE ON DISC
      NEWVAL (N)=NEWVAL (N)+1
C
      PACK NEW VALUE INTO MAN(I,J,K)
      LAMDA=MAN(II.IJ.K)
      CALL UNPACK(LAMDA, VECTOR(1),10)
      VECTOR(L)=NEWVAL(N)
      CALL PACK(VECTOR(1), LAMDA, 10)
      MAN(II,IJ,K)=LAMDA
      CALL DISCUT(IDF, IREC(N), 1, MAN)
      CONTINUE
```

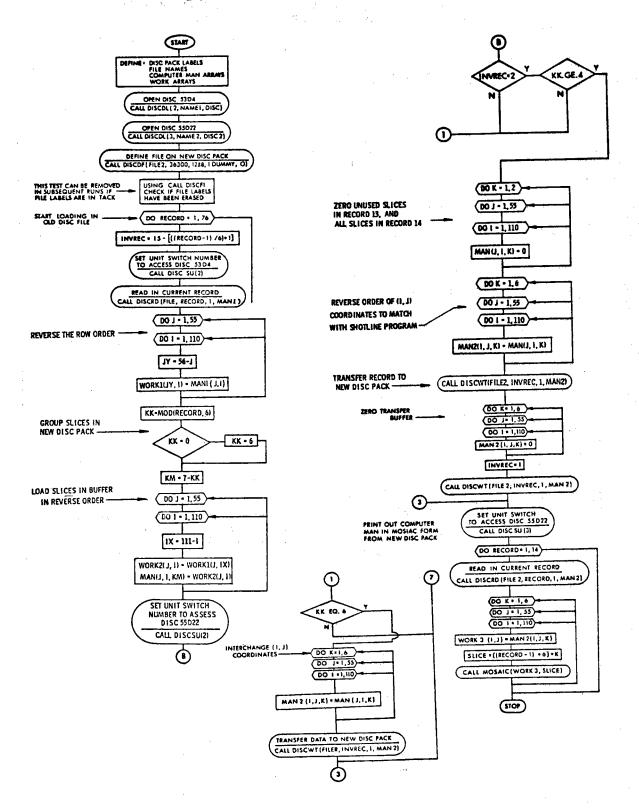




```
COMMON/MAN/MAN(11C,55,6), NSLICE(14), KNUM(14), KMR1(84), KMR2(84), I1,
     112,J1,J2,K1,K2,ISECT,ISL,NSECT,KCOUNT,KSECT,KT.KMIN.KMAK.KN
      COMMON/MAN1/MAN1(110,55,6)
      CCMMCN/MAN2/MAN2(110,55,6)
      COMMON/WORK3/WCRK3(110,55)
      COPPON/NAME2/NAME2(4)
      COMMON/NAMES/NAMES(4)
      INTEGER DISC2, FILE 2, WORK 3
      INTEGER DISC3, FILE3
      INTEGER RECORD
      INTEGER SLICE
      CATA CISC2/1CH55D22 CMAN/
      CATA CISC3/1CH55D24 KMAN/
      CATA: FILE2/ICHINCAP BODY/
      CATA FILE3/1CHBCDY PARTS/
      CALL DISCOL(3, NAME2, DISC2)
      CALL DISCOL(2, NAME 3, DISC3)
C
      CEFINE FILE FOR NEW DISC PACK
      CALL DISCOF(FILE3, 36300, 1288, IDUMMY, 0)
C
      NUM IS THE NUMBER OF SEPERATE INTERIOR BOXES RECUIRED TO SEPERATE
      A DESIGNATED SECTION FROM THE REMAINDER OF THE COMPUTER MAN
      READ(5,120)NUM, ISECT, ISL
  120 FORMAT(3[3)
      CALL DISCSU(2)
      5.0 = 1
      DO SO MEINUM
      REAC(5.100) 11,12,J1,J2,K1,K2
  100 FORMAT(613)
      CO 21 I=1. ISECT
      KNUM(I)=0
      NSLICE(I)=0
   21 CONTINUE
      CC 22 I=1.84
      KMRI(I)=0
      KMR2(I)=0
   22 CONTINUE
      CALL CALSCE
      WRITE(6,110)
      FORMAT(1GX, 'KNLM', 1CX, 'NSLICE')
      CC 7 I=1,14
      WRITE(6, 102)(KNUM(I), NSLICE(I))
      CONTINUE
      FORMAT(10X,14,10X,14)
102
      WRITE(6,103)
103
      FORMAT(10x, 'KMR1', 10x, 'KMR2')
      CO 8 I=1.84
      11=85-1
      hRITE(6,104) (KMR1(II)), (KMR2(II))
      CONTINUE
104
      FORMAT(10X, 14, 10X, 14)
      CO 10 RECCRD=1, ISECT
      IF(KNUM(RECCRD).EQ.O) GO TO 10
      CALL DISCSU(3)
      CALL DISCRO(FILE2, RECORD, 1, MAN)
C
      ZERC ARRAY MAN1
      CO 11 I=1,110
      CO 11 J=1,55
      CO 11 K=1.6
      MANI(I,J,K)=C
11
      CONTINUE
      IN=RECORD
      KMIN=KNUM(IN)
      KMAX=KNUM(IN)+(NSLICE(IN)-1)
      CO 2 K=KMIN,KMAX
      CO 2 I=1.,12
      CO 2 J=J1,J2
      MAN1(I,J,K)=MAN(I,J,K)
2
      CONTINUE
```

```
CALL DISCSU(2)
      ACC THE FOLLOWING INSTRUCTIONS WHEN MORE THAN I INTERIOR BOXIS
      REQUIRED TO SECTION OFF THE DESIRED PORTION OF BOCY
C
      CTHERWISE OMIT
      CALL DISCRD(FILE3,RECORD,1,MAN2)
      CO 20 I=1.110
CO 20 J=1.55
      CO 20 K=1,6
      IF(MAN1(I,J,K).EQ.C) MAN1(I,J,K) = MAN2(I,J,K)
      CALL DISCHT(FILE3, RECORD, 1, MANI)
10
      CONTINUE
   50 CONTINUE
C
C
Č
      PRINT OUT COMPUTER MAN IN MOSAIC REPRESENTATION
      CO 60 RECCRD=1. ISECT
      CALL DISCRO(FILE3, RECORD, 1, MAN2)
      CC 18 K=1.6
      CO 16 J=1,55
CO 16 I=1,110
      WORK3(I,J)=MAN2(I,J,K)
16
      CONTINUE
C
      CALCULATE CRCSS SECTION NUMBER (1-84)
      SLICE=(RECCRD-1)+6+K
      CALL MOSAIC(WORK3, SLICE)
      CONTINUE
   60 CONTINUE
      ENC
```

```
SUPROUTINE CALSCE
      COPMON/MAN/MAN(110.55.6).NSLICE(14).KNUM(14).KMR1(84).KMR2(84).II.
      112, J1, J2, K1, K2, ISECT, ISL, NSECT, KCOUNT, KSECT, KT, KPIN, KPAX, KN.
      LCGICAL JUMP
       JUMP = TRUE INDICATES THAT THE 1ST DELINEATED SLICE IN A SECTION
C
       HAS BEEN ENCCUNTERED
C
       SET SECTION MARKERS
       SET SLICE MARKERS
       JUMP=.FALSE.
      KSECT=0
       CO 2 I=K1.K2
      KMR1(1)=1
     2 CONTINUE
       CO 1 I=ISL, 84, ISL
       KMR2(1)=1
     1 CONTINUE
       CO 3 I=1, E4
       IF(JUMP) GO TO 5
       KT=FOC(I, ISL)
       WHERE KT VARIES FROM 1-ISL
C
       IF(KT.EQ.C) GO TO 6
     8 IF(KMR1(1).EQ.0) GO TO 3
       KN=KT
       JUMP=.TRUE.
     5 IF(KMR1(I).EQ.1) KCOUNT=KCOUNT+1
       IF(KMR2(I).EQ.1) GC TO 4
       GO TO 3
     4 KSECT=KSECT+1
       CALL SOR F
       JUPP=.FALSE.
     3 CONTINUE
       60 TC 7
     6 KT=ISL
       IF(KMR1(I).EQ.O) KSECT=KSECT+1
       GO TO 8
     7 RETURN
       ENC
      SUPRCUTINE SORT
      KSECT REPRESENTS THE NUMBER OF SECTIONS
      THAT CONTAIN DELINEATED SLICES .
      COMMON/MAN/MAN(11C,55,6), NSLICE(14), KNUM(14), KMR1(84), KMR2(84), I1,
     112,J1,J2,K1,K2,ISECT,ISL,NSECT,KCOUNT,KSECT,KT,KMIN,KMAX,KN
C.
      SAVE ACCRESS WHERE THE 1ST 1 APPEARS RELATIVE TO THE
    * EEGINNING OF FACH SECTION
      NSLICE(KSECT) = KCCLNT
      KNU? (KSECT)=KN
      KCCUNT=0
      KN=0
      RETURN
      END
```



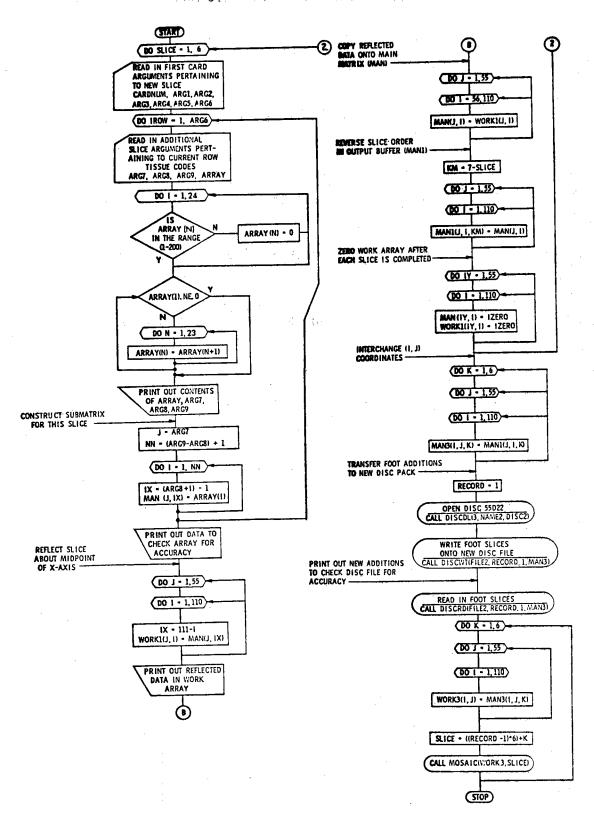
```
LIST(START)
      MAXO(5GOJ)LINES
      MAXT(18) YINS
      COMM DISC 53D4 TO UNIT 2
      COMM DISC 55D22 TO UNIT 3
C
C
                              MAIN ROUTINE
C
      THIS PROGRAM IS DESIGNED TO TRANSFORM THE POSITION OF THE
C
      COMPUTER MAN TO MATCH THAT OF THE LETHALITY DESCRIPTION
C
      ALSO THE RECORD LENGTH IS INCREASED FROM 1-6 SLICES PER RECORD
C
      GUR NEW COMPUTER MAN IS STORED ON DISC PACK 55D22
      DATA DISC/10H53D4 C MAN/
      DATA DISC2/10H55D22 CMAN/
      DATA FILE/1JHBGDY
      DATA FILE2/10HINCAP BODY/
        DATA READER/5/, WRITER/6/
      COMMON /MAN/MAN(55.110.6)
      COMMON/MAN1/MAN1(55,110)
      COMMON/MAN2/MAN2(110,55,6)
      COMMON /WORK1/WORK1(55,110)
      COMMON /WCRK2/WORK2(55,110)
      COMMON/WCRK3/WORK3(110,55)
      COMMON /NAME1/NAME1(4)
      COMMON /NAME2/NAME2(4)
      DIMENSION IFIL(131), LOR(131), ITR(131), LTR(131), MAXNR(131),
     AIHRU(131), IHTU(131), ICI(131)
      INTEGER WORK1, WORK2, RECORD
      INTEGER FILE.FILE2
      INTEGER WORKS
      INTEGER
                  SLICE
      INTEGER READER, WRITER, DISC, DISC2
      CM INCAPACTATION MODEL IS DIVIDED INTO 14 RECORDS
      SIX SLICES PER RECORD
C
      THE RECORD LENGTH FOR FILE 2 IS 36300 WORDS
C
      OPEN THE DISC TO BOTH FILES 5304 ,55022
C
      THE RECORD LENGTH OF FILE1 IS 6050 WORDS
C
      CALCULATE CORRECT RELATIVE RECORD NUMBER FOR NEW FILE
C
       FILE 1
                 1-6
                       7-12 13-18
                                          79-84
C
       FILE 2
                                3
                                           14
                  1
                         2
      CALL DISCOL(2, NAME1, DISC)
      CALL DISCOL(3, NAME2, DISC2)
      CALL DISCOF(FILE2,36300,1288,IDUMMY,0)
      IFIL(1)=0.0
      CALL DISCFICIFIL, LOR, ITR, LTR, MAXNR, IHRU, IHTU, ICI)
      DO 328 I=1,131
      IF(IFIL(I).NE.O) WRITE(6,110) (IFIL(I),LOR(I),ITR(I),LTR(I),
     AMAXNR(I), IHRU(I), IHTU(I), IÇI(I))
328
      CONTINUE
110
      FORMAT(410,2X,7(14,2X))
      DO 11 RECORD=1,76
      INVREC=((REC)RD-1)/6)+1
      INVREC=15-INVREC
```

LOAD HIGHEST RECORD FIRST

C

```
CALL DISCSU(2)
      CALL DISCRD(FILE, RECORD, 1, MAN1)
C
      K IS EQUAL TO SLICE NUMBER WITHIN RECORD
C
      INVERT COMPUTER MAN
      DO 20 J=1,55
      DO 20 [=1.110
      JY=56-J
      WORK1(JY,I)=MAN1(J,I)
20
      CONTINUE
      1ST ROTATE CM 180 DEGREES CLOCKWISE ABOUT X-AXIS
C
      2ND ROTATE CM 180 DEGREES COUNTERCLOCKWISE ABOUT Z AXIS
C
C
      ROTATE COMPUTER MAN GODEGREES COUNTEPCLOCKWISE ABOUT Z-AXIS
C
      REVERSE THE ROW ORDER
C
      REVERSE THE COLUMN ORDER
      REVERSE THE RECORD ORDER
      LOAD BACK INTO MAN
      KK=MOD(RECORD,6)
      IF(KK.EQ.C) KK=6
      REVERSE SLICE ORDER BEFORE LOADING INTO NEW RECORD
C
      PERFORM A LIMIT CHECK ON KM
C
      IF(KM.GE.1.AND.KM.LE.6) GO TO 71
      WRITE(6,108) KM
1 38
      FORMAT(1,X,14)
      GO TO 11
71
      CONTINUE
      DO 30 J=1.55
      DO 30 I=1,110
      IX=111-I
      WQRK2(J,I)=W:RK1(J,IX)
      MAN(J,I,KM) = WORK2(J,I)
      CONTINUE
30
      TRANSFER TO NEW DISC FILE
C
      CALL DISCSU(3)
C
      DEFINE DISC FILES FOR NEW DISC PACK
      FILE2 IS NEW DISC LABEL
C
      CALL DISCOF(IFIL, LOR, NT, IAV, K)
      NT IS NUMBER OF TRACKS NEEDED 36300/398
      LOR IS LENGTH OF DISC RECORD
C
      IAV IS ADUMMMY VARIABLE
      K DEFINES SOME ACTION TO BE TAKEN ON IFILE K=0 CLEARS FILE
C
C
      IF RECORD FILE FILE2 IS FILLED WRITE RECORD ONTO DISC
C
      WRITE ON UNWRITTEN RECORD 1 AND RECORD 2 SLICES 5.6
      IF(INVREC.EQ.2.AND.KK.GE.4) GO TO 50
      GO TO 12
      DO 80 K=1,2
50
      D0.80 J=1.55
      DO 80 I=1.110
      MAN(J.I.K)=0
80
      CONTINUE
      DO 3 K=1.6
      DO 3 J=1,55
      DO 3 I=1,110
      MAN2(I,J,K)=MAN(J,I,K)
3
      CONTINUE
      CALL DISCHT(FILE2, INVREC, 1, MAN2)
      GO TO 70
```

```
12
        CONTINUE
        IF(KK.E0.6)G0 TO 101
 11
        CONTINUE
 131
        CONTINUE
 C
 C
 C
        INTERCHANGE X-Y COURDINATES
 C
        ROTATE COMPUTER MAN 90DEGREES ABOUT Z AXIS
        DO 2 K=1.6
        DO 2 J=1.55
        DO 2 I=1,110
        MAN2(I,J,K)=MAN(J,I,K)
2
        CONTINUE
        CALL DISCWT(FILE2.INVREC.1.MAN2)
        GO TO 11
 C
        PRINT OUT COMPUTER MAN IN MOSAIC FORM FROM NEW FILE
  70
        CONTINUE
        CALL DISCSU(3)
        DO 15 RECCRD=1,14
        CALL DISCRD(FILE2, RECORD, 1, MAN2)
 C
        K IS EQUAL TO SLICE NUMBER WITHIN EACH RECORD
        DO 18 K=1,6
        DO 16 J=1.55
        DO 16 I=1,110
        WORK3(I,J)=MAN2(I,J,K)
 16
        CONTINUE
        CALCULATE CRUSS-SECTION NUMBER (1-84)
 C
        SLICE=((RECORD-1)*6)+K
        CALL MOSAIC (WORK3, SLICE)
        CONTINUE
  18
  15
        CONTINUE
        END
```



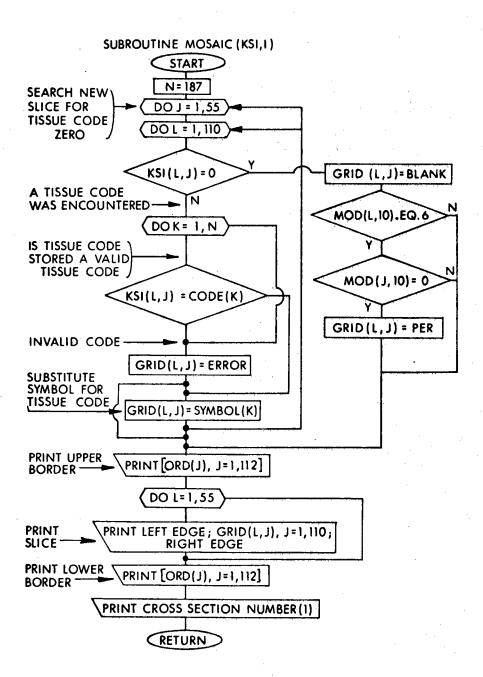
```
LISTISTARTI
      MAXT(5)MINS
      MAXI(2000)LINES
      COMM DISC 55D22 TO UNIT 3
       INTEGER CARDNUM, ARG1, ARG2, ARG3, ARG4, ARG5, ARG6, ARRAY, WORK1, PLANE
       INTEGER ARG7, ARG8, ARG9
       INTEGER WOTH, HGHT
       INTEGER FILEZ.DISC2
       INTEGER RECORD
       INTEGER SLICE
       INTEGER WORKS
       DIMENSION ARRAY(55), PLANE(50, 20), WORK1(55, 110)
       COMMON/WORK3/WORK3(110,55)
      COMMON/MAN3/MAN3(110,55,6)
      COMMON/MAN/MAN(55,110)
      COMMON/MAN1/MAN1(55,110,6)
      COMMCN/MAN2/MAN2(55,110,6)
      COMMON/NAME2/NAME2(4)
       DATA IZERO/O/
       DATA DISC2/10H55D22 CMAN/
       DATA FILE2/10HINGAP BODY/
       THIS SUBROUTINES READS THE ADDITIONAL FOOT
C
C
       SLICES ONTO THE DISC FROM CARDS. THUS THE
, C
       INCAPACITATION MODEL INCREASES IN HEIGHT
C
       THIS PROGRAM ADDS 6 ADDITIONAL PORTIONS TO THE FEET .
C
       IN THE INCAPACITATION MAN
C
       ARG1 = STARTING POSITION OF SUBMATRIX
                                                UN Y AXIS
                   END POSITION OF SUBMATRIX
C
                                                ON Y AXIS
       ARG2 ≃
C
       ARG3 = STARTING POSITION
                                 OF SUBMATRIX
                                                DN X AXIS
C
                   END POSITION
                                 OF SUBMATRIX
                                                ON X AXIS
       ARG4 =
C
       ARG5 = NUMBER OF COLUMNS FOR SUBMATRIX
       ARG6 = NUMBER OF ROWS FOR SUBMATRIX
C
C
       ARGUMENTS 7-9 PERTAIN TO EACH INDIVIDUAL ROW OF TISSUE CODES
¢
       ARG7 = Y COORDINATE OF ROW
C
       ARG8 = STARTING X COORDINATE OF TISSUE CODES
       ARG9 = X COURDINATE WHERE TISSUE CODES END
       DO 2000 SLICE=1.6
       READ(5,100)CARDNUM,ARG1,ARG2,ARG3,ARG4,ARG5,ARG6
100
       FORMAT([3,1X,614)
       DO 1000 IROW=1, ARG6
       READ(5,101) ARG7, ARG8, ARG9, (ARRAY(N), N=1,24)
101
       FORMAT(12,1X,12,1X,12,12,2313)
       DO 10 I=1,24
       IF((ARRAY(I).GE.1).AND.(ARRAY(I).LE.200)) GO TO 10
       ARRAY(I)=IZERO
10
       CONTINUE
       SHIFT TISSUE CODES UPWARDS IN INPUT BUFFER(ARRAY)
C
C
       SUCH THAT ARRAY(1) CONTAINS AN ENTRY
C
       CALCULATE INDEX TO RETRIEVE CORRECT ENTRY FROM ARRAY
       CONSTRUCT OUR SUBMATRIX WORKI(Y.X) USING OUR ARGUMENTS
       IF(ARRAY(1).NE.O)GOTO 75
       DO 60 N=1.23
       ARRAY(N) = ARRAY(N+1)
60
       CONTINUE
       GOTO 65
75
       CONTINUE
       WRITE(6,103) (ARRAY(I), [=1,24)
```

133

FORMAT(1.X, 2413)

```
TRANSFER CONTENTS OF ARRAY TO WORKI
      USING ADDITIONAL DATA READ IN
      INSERT ENTRY IN CORRECT LOCATION
      CONSTRUCT SUBMATRIX FOR THIS SLICE
C
      PRINT ARG7, ARG8, ARG9
C
      WRITE(6,1C4) ARG7, ARG8, ARG9
104
      FORMAT (5X,3(12,2X))
      MOTH=(ARG4=ARG3)+1
      HGHT-tARG2-ARG11+I
      J=ARG7
      NN=(ARG9-ARG8)+1
      DO 200 [=1.NN
      IX=(ARG8+I)-1
      MAN(J, IX) = ARRAY(I)
200
      CONTINUE
1000
      CONTINUE
C
      PRINT OUT DATA TO CHECK ARRAYS FOR ACCURACY
      DO 300 K=1,55
      WRITE(6,1C2) (MAN(K,I),I=1,55)
300
      CONTINUE
102
      FORMAT(3.13,/,2513)
      REFLECT SLICE ABOUT MIDPOINT OF X-AXIS THE LINE X=55
C
C
      COPY REFLECTED DATA ONTO WORK MATRIX
      DO 500 J=1.55
      DO 500 I=1,110
      IX=111-I
      WORK1(J,I)=MAN(J,IX)
500
      CONTINUE
C
      PRINT OUT REFLECTED DATA IN WORK! ARRAY
      DO 400 K=1.55
      WRITE(6, 1C6)(WORK1(K, I), I=56, 110)
106
      FORMAT(3013./.2513)
400
      CONTINUE
C.
      COPY REFLECTED DATA ONTO MAIN ARRAY (MAN)
      DO 600 J=1,55
      DO 600 I=56,110
      MAN(J,I) = WORK1(J,I)
600
      CONTINUE
C
      REVERSE SLICE ORDER IN OUTPUT BUFFER (MAN1)
C
      FOOT SLICES WILL BE CROSS-SECTIONS 79-84
      KM=7-SLICE
      DO 900 J=1,55
      DO 900 I=1,110
      MANI(J,I,KM) = MAN(J,I)
930
      CONTINUE
      ZERO WORK ARRAY AFTER EACH SLICE IS COMPLETED
      DO 105 IY=1,55
      DO 105 I=1,110
      MAN(IY, I) = IZERO
      WORK1(IY, I)=IZERO
105
      CONTINUE
2000
      CONTINUE
      THESE ADDITIONAL FOOT SLICES AND THE PRECEEDING FOOT SLICES
C
C
      ARE NOT CUTS MADE PARRALLEL TO X-Y PLANE
C
C
      INTERCHANGE X-Y COORDINATES
      ROTATE COMPUTER MAN 900EGREES ABOUT Z AXIS
      00 2 K=1,6
      DO 2 J=1,55
      DO 2 I=1,110
```

```
MAN3(I.J.K)=MAN1(J.I.K)
2
C
      CONTINUE
      READ IN NEW DISC FILE 55D22 RECORD 1
      RECORD=1
      CALL DISCOL(3,NAME2,DISC2)
      CALL DISCHT(FILE2.RECORD.1.MAN3)
      CALL DISCRD(FILE2, RECORD, 1, MAN3)
C
      K IS EQUAL TO SLICE NUMBER WITHIN EACH RECORD
      DO 18 K=1,6
      DO 16 J=1,55
      DO 16 I=1.110
      WCRK3(I,J)=MAN3(I,J,K)
16
      CONTINUE
      CALCULATE CROSS-SECTION NUMBER
      SLICE=((RECGRD-1)*6)+K
      CALL MOSAIC(WORK3, SLICE)
      CONTINUE
18
15
      CONTINUE
      END
```



```
SUBROUTINE MOSAIC(KSI.I)
DIMENSIDA KSI(110,55), GRID(110,55), ORD(112)
COMMON/SYMBOL/SYMBOL (200)
 COMMON/CODE/CODE(200)
 INTEGER KSI, GRID, SYMBOL, CODE, ERROR, BLANK, EDGE1, EDGE2, ZERO.
          PER.GRD
      SYMBCL/
      1HQ, 1HW, 1HE, 1HR, 1HT, 1HY, 1HU, 1HI, 1HO, 1HP, 1HA, 1HS, 1HD,
      1HF, 1HG, 1HH, 1HJ, 1HK, 1HL, 1HZ, 1HX, 1HC, 1HV, 1HB, 1HN, 1HM,
      1HO, 1H1, 1H2, 1H3, 1H4, 1H5, 1H6, 1H7, 1H8, 1H9, 1HQ, 1HW, 1HE,
      1HR, 1HT, 1HY, 1HU, 1HI, 1HG, 1HP, 1HA, 1HS, 1HD, 1HF, 1HG, 1HH,
      1HJ,1HK,1HL,1HZ,1HX,1HC,1HV,1HB,1HM,1HM,1HO,1H1,1H2.
      1H3, 1H4, 1H5, 1H6, 1H7, 1H8, 1H9, 1H0, 1HW, 1HE, 1HR, 1HT, 1HY,
      1HU, 1HI, 1HO, 1HP, 1HA, 1HS, 1HD, 1HF, 1HG, 1HH, 1HJ, 1HK, 1HL,
      1HZ.1HX.1HC.1HV.1HB.1HN.1HM.1HO.1H1.1H2.1H3.1H4.1H5.
       1H6,1H7,1H8,1H9,1HQ,1HW,1HE,1HR,1HT,1HY,1HU,1HI,1HO,
      1HP, 1HA, 1HS, 1HD, 1HF, 1HG, 1HH, 1HJ, 1HK, 1HL, 1HZ, 1HX, 1HC,
A
      1HV, 1HB, 1HM, 1HM, 1HO, 1H1, 1H2, 1H3, 1H4, 1H5, 1H6, 1H7, 1H8,
٨
       1H9, 1H0, 1HW, 1HE, 1HR, 1HT, 1HY, 1HU, 1HI, 1HI, 1HP, 1HA, 1HS,
       1HD.1HF.1HG.1HH.1HJ.1HK.1HL.1HZ.1HX.1HC.1HV.1HB.1HN.
       1HM, 1HO, 1H1, 1H2, 1H3, 1H4, 1H5, 1H6, 1H7, 1H8, 1H9, 1HQ, 1HW,
       1H3,1HT,1HT,1HL,1HR,13*1H-/
```

```
DATA CODE/
     2, 3, 4, 5, 6, 23, 7, 8, 9, 10, 24, 11, 12,
В
     13, 14, 179, 15, 16, 17, 18, 173, 174, 19, 20, 21, 22,
C
     25,55,26,27,28,29,30,31,32,175,176,33,34,
D
     35, 36, 37, 38, 39, 40, 41, 42, 177, 178, 43, 44, 45,
E
     46,47,48,49,50,51,52,53,54,73,55,56,57,
     58,59,60,61,62,63,64,65,66,67,68,75,69,
G
     70,71,72,73,96,74,76,77,78,79,180,80,81,
H
     82,83,84,85,86,87,88,89,99,100,90,91,92,
I
     93,94,95,96,119,97,98,101,200,102,103,104,105,
     106,110,111,107,108,109,112,113,114,115,116,117,118,
Κ
     119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131,
t
     132,133,134,135,136,137,138,139,140,141,142,146,143,
     144,145,147,149,150,151,152,153,154,155,156,157,158,
M
     159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171,
     172,181,182,183,184,13*C/
 DATA N /187/
 DATA GRD /112*1H./
```

```
DO 20 J=1,55
      DO 20 L=1,116
               IF (KSI(L,J).EQ.Q)GO TO 70
               00 25 K=1,N
                   IF(KSI(L,J).EQ.CODE(K))GOTO 30
25
               CONTINUE
               GRID(L,J)=ERROR
               GOTO 20
37
               GRID(L,J)=SYMBOL(K)
20
         CONTINUE
         WRITE(6,107)
      FORMAT( +Y 1)
107
         WRITE(6, 106)(ORD(J), J=1, 112)
106
         FORMAT(112A1)
      DO 85 J=1,55
      JJ=56-J
      WRITE(6,106)EDGE1,(GRID(L,JJ),L=1,110),EDGE2
85
         CONTINUE
         WRITE(6,106)(ORD(J),J=1,112)
         WRITE(6,100)1
100
      FORMAT( 101,46X, CROSS SECTION 1,15,35X, 1+X1)
      RETURN
      GRID(L,J)=BLANK
70
      IF(MOD(J,10).EQ.6.AND.MOD(L,10).EQ.D)GRID(L,J) =PER
      GO TO 20
      END
```

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